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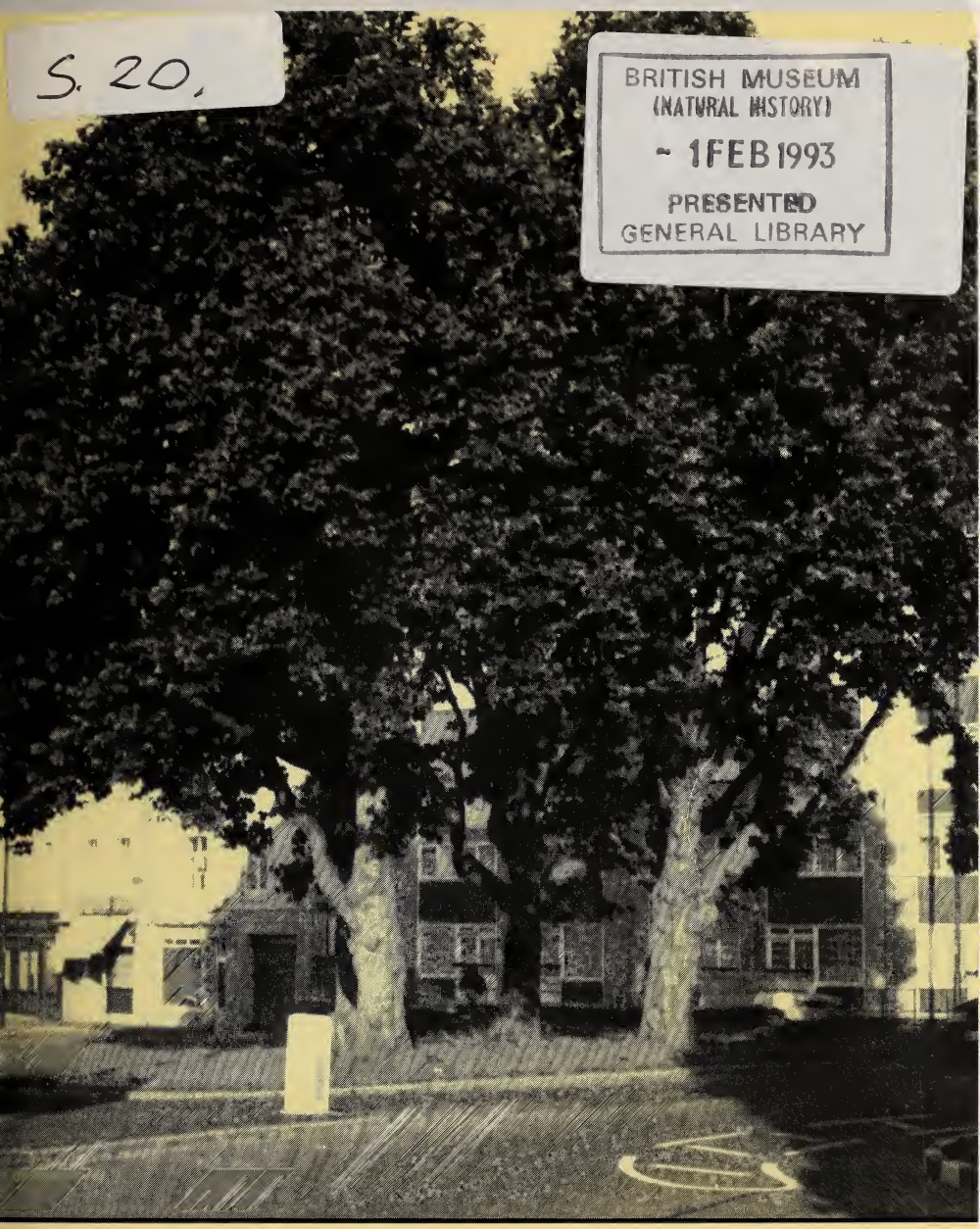

NATURE IN AVON

PROCEEDINGS OF THE BRISTOL NATURALISTS' SOCIETY, 1991

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NATURE IN AVON

THE PROCEEDINGS OF THE BRISTOL NATURALISTS' SOCIETY

VOLUME 51 (for 1991)

EDITED BY P. R. CROWTHER

ASSISTED BY A COMMITTEE

"*Rerum cognoscere causas.*"—VIRGIL.

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Printed for the Society by Impress, Bedminster, Bristol

COUNCIL, 1991

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Geological	President:	D. A. Wilson
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	Hon. Secretary:	R. G. Holmes
Entomological		(vacant)

Other Members of Council:

R. J. Barnett
G. R. Best
Miss A. Heckels
Dr G. Jones
Dr M. H. Martin
Dr H. E. Rose
Mrs H. Titchen
D. P. C. Trump
Dr R. S. Wilson

VOLUME 51

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REPORT OF COUNCIL, 1991

Membership at the end of 1991 was 590. At the Annual General Meeting on 19 January, Officers and Members of Council were elected, with Mr R. G. Symes as President. Council held ten meetings during the year.

The charges for use of the University premises were increased sharply for 1991, so during the summer alternative venues were sought for both Council meetings and lectures. Most General Meetings have been held in the Victoria Church Hall, the first three again being on Saturday afternoons. The Society is grateful to Bristol City Museums and Art Gallery for providing venues for several Council meetings, for the meetings of the Botanical Section and for space at the 'Beetle Down' event to publicise our activities.

There were changes regarding the annual supper also. It was held at a new venue, the Hall of the Church of the Good Shepherd, Henleaze, in May, and members of the Society undertook the catering with results both popular and profitable. The guest speaker was Dr Scott Jones, who spoke about his research in the Gambia.

Two volumes of the *Proceedings* were published: that for 1988 was a special issue on *Bristol's Urban Ecology*; this was followed by an ordinary issue for 1989. Council expresses appreciation for the considerable work and expertise that these volumes represent from all those involved - the Editors (Mr Frey and Dr Crowther), and Mr Grenfell, Mr Taylor and Dr Rose in the production of camera-ready copy.

The Society's membership list is in course of being transferred to a micro-computer. When the operation is complete it is proposed to return to our former practice of publishing the list from time to time; meantime, adhesive address labels for Bulletins etc are being produced for new members and those whose addresses have changed. Many Bulletins arrive on your doorsteps through the good offices of a team of volunteer distributors, to whom Council renders its thanks.

A full programme of some 50 field meetings was organised, also a study evening and a workshop on lichens. Members of the Society have led walks in Avon County Council's 'Walking in Avon' series and participated in English Nature's 'Dawn to Dusk' event in the Avon Gorge. Liaison continues with Cardiff and Gwent Naturalists' Societies and with the Avon Wildlife Trust. Three members represent the Society on the Severn Estuary Conservation Group.

Members of Council have submitted comments on various conservation matters, particularly Uphill and Windsor Hill Marsh SSSI, and supported moves by the City Museum and Art Gallery to retain in Bristol the Flowering Plant section of the University of Bristol Herbarium.

The Hector Hockey Fund supported the purchase of record cards for the *Atlas of Somerset flora* project and of fencing for an area of Littley Wood. The Society's Conservation Fund made contributions to the River Derwent Appeal in Yorkshire (which had national implications), the Woodland Trust (towards the purchase of the Little Doward in the Wye Valley) and Somerset Trust for Nature Conservation (towards the purchase of Bishopswood meadows in the Blackdown Hills).

We record with regret the deaths during 1991 of Mr C. S. H. Blathwayt, Mrs M. A. Fear, Mr A. L. Grenfell, Mrs G. R. Hamilton, Mr J. Milton, Dr D. V. Richmond and Miss I. M. Westcott.

C. S. H. Blathwayt, M.A., F.R.E.S., who died on 5 May 1991 aged 76, had been a member of the Society since 1944. A knowledgable all-round naturalist but primarily a keen lepidopterist, he was most active in the Entomological Section (Hon. Secretary 1949 - 1953; Recorder for Lepidoptera 1948 - 1963, contributing "Lepidoptera Notes, Bristol District" to the *Proceedings*). Operating a light trap in the garden of his home at Weston-super-Mare from about 1947 onwards, he added many rare species to the list for that area. He was, as he put it, "rather partial to the 'Pugs'", a group of small geometrid moths notoriously difficult to separate, and could usually confidently put a name to any specimen shown to him. His frequent visits to various Somerset localities confirmed numerous old records and resulted in many additions to the county list (notably the Devon Carpet, *Lampropteryx otregiata*, on the Somerset Levels). With expeditions to other parts of England and Wales he built up a comprehensive collecton of the British Lepidoptera which, with his notebooks, he bequeathed to Bristol City Museum and Art Gallery.

A memoir of **A. L. Grenfell** appears on pp. 10 - 11. **Mrs G. R. Hamilton** had been a member since 1963; primarily interested in geology, she served at various times on the Geological Section Committee, and was a member of Council from 1985 to 1989. **John Milton**, C.Eng., M.I.Mech.E., who died on 23 September at the age of 96, had been a member since 1947. A keen general naturalist, he led field meetings; he was a noted apiarist.

SYLVIA KELLY, *Hon. Secretary.*

GENERAL MEETINGS, 1991

19 Jan.	Annual General Meeting & Presidential Address - "The encircling year - a naturalist's calendar", by Miss R. C. Lee.
23 Feb.	"The Somerset peat moors", by Mr B. Storer.
16 Mar.	"Wildlife of Ruanda", by Mr A. Plumptre.
7 May	Annual Buffet Supper - "Wildlife and conservation in the Gambia", by Dr S. Jones.
10 Oct.	"Amenity trees", by Mr J. White.
7 Nov.	"Landscape and the naturalist", by Ms M. A. Robinson.
30 Nov.	"The dawn of the dinosaurs", by Dr M. J. Benton.

SYLVIA KELLY, *Hon. Secretary.*

GENERAL FIELD MEETINGS, 1991

29 Mar.	Miss S. Garden. Llanthony Priory and the Wye Valley. A grey, cold and very early Good Friday. A circular walk on the hillside above the priory, and then a walk from Whitebrook to Redbrook in the Wye Valley. Early spring flowers and some birdsong were noted.
27 Apr.	Mr D. A. Cullen. Brean Down and the Somerset Levels. Observations included peregrine, whimbrel, swift, swallows, yellow wagtails and willow warblers, white rock roses, least forgetmenot and cowslips.

18 May Miss M. E. Jervis. Abergavenny area. A morning walk along an old rail way track and a canal, for woodland flora and birds. An afternoon climb up and along the west side of the Skirrid gave good views; flowers included sheets of bluebells, and birds seen included a peregrine and a family of ravens.

20 May Mr D. A. Cullen. Gordano Valley. A fine evening to see nesting lapwing and redshank, cuckoo, warblers and spring flowers.

29 Jun. Miss S. Garden. Pewsey Vale. A three-mile circular walk on part of the Wansdyke and chalk downland, with the typical associated flora, and excellent views. An afternoon walk along a short stretch of the Kennet & Avon Canal, with contrasting flora, and waterside birds.

13 Jul. Mr R. Curber. Abbotsbury and the Fleet, and the Sub-tropical Gardens. An interesting visit, despite poor weather, with good views of common tern, swans and waders on the Fleet, and many salt marsh plants at the base of Chesil Bank.

29 Jul. Mrs A. Hollowell. An evening walk along the River Frome to see a wealth of flowers along the banks and in the nearby meadows and scrub. Many plants were new to members.

7 Sep. Miss R. C. Lee. Cotswolds. A morning walk from Stanway to Stanton, noting the various trees in the park, with afternoon visits to the Cotswold Farm Park and the Rare Breeds Survival Centre.

5 Oct. Miss S. Garden. Undy and Portskewett. A morning walk over fields to the sea wall at Undy. Some late flowers wweree seen, but few birds. An afternoon walk to the picnic site at Portskewett, for excellent views across the Severn.

9 Nov. Miss R. C. Lee. New Forest. A circular walk from Beaulieu Road over heathland and through woods yielded a few birds, some fine fungi, bog bean, bog myrtle and some stream flora. The vivid autumn colours under sunshine and blue skies made this the New Forest at its best.

RACHEL C. LEE, *Hon. Secretary, Field Committee.*

REPORT OF THE BOTANICAL SECTION, 1991

At the Annual General Meeting held on 31 January 1991 the following were elected: President - Mr A. C. Titchen; Hon. Secretary & Treasurer, Mr A. G. Smith; Committee - Lady Rosemary Fitzgerald, Miss I. F. Gravestock, Mrs C. Kitchen, Mr M. A. R. Kitchen, Mrs E. McDonnell, Dr N. Malcolm, Mr P. J. M. Nethercott, Miss A. P. Pockson and Mrs N. Vaughan Davies. During the year Lady Fitzgerald and Mrs McDonnell asked to stand down, due to other commitments, and Mr C. W. Hurfurt was co-opted on to the Committee.

The following indoor meetings were held:

31 Jan. Annual General Meeting & Members' Evening.

28 Feb. "A very rich fen meadow", by Mr A. G. Smith.

28 Mar. "Botanizing in Western Australia", by Mr R. M. Payne.

24 Oct. "Andalusia for botanists", by Mr P. Thomson.

28 Nov. "Lichens - their use and abuse", by Dr D. Brown.

16 Dec. "Photocall" - members' slides.

The following field meetings took place, under the leadership of those shown:

10 Mar. Harptree Combe, for bryophytes, Mr P. Martin.

10 Apr. Avon tow-path and Leigh Woods, Mr P. J. M. Nethercott.

28 Apr. Chelsea Physic Garden and Sandford Mill, Berkshire, Miss I. F. Gravestock.

14 May Weston Big Wood, Mrs H. Titchen.

21 May Durleigh Hill, Mr A. C. Titchen.

26 May Brean Down, Mr A. L. Grenfell & Mrs E. McDonnell.

11 Jun. Iron Acton, Mr A. L. Grenfell.

15 Jun. Charterhouse, Miss P. Pockson.

26 Jun. Combe Dingle, Mr R. J. Barnett & Mr A. G. Smith.

7 Jul. Catcott Parish Plot, Mr A. G. Smith.

17 Jul. Leigh Woods, Mr P. J. M. Nethercott.

27 Jul. Frenchay, Mr P. J. M. Nethercott.

7 Aug. Lower Woods, Wickwar, Mr & Mrs M. A. R. Kitchen.

25 Aug. Dundas Aqueduct, Mr A. L. Grenfell.

15 Sep. Forest of Dean, Mr A. C. Titchen.

20 Oct. Westonbirt Arboretum, Mr J. White.

3 Nov. Fungus foray in Edford Wood, Mr J. Keylock.

ANTHONY G. SMITH, *Hon. Secretary.*

REPORT OF THE GEOLOGICAL SECTION, 1991

At the Annual General Meeting held on 17 January 1991 the following were elected: President - Mr D. A. Wilson; Hon. Secretary - Dr P. R. Crowther; Hon. Field Secretary - Mr S. Carpenter; Hon. Treasurer - Mr V. Dennison; Committee - Dr M. J. Benton, Mr D. Cope, Mr M. T. Curtis, Mrs G. Hamilton, Mrs M. E. Poolman and Dr M. J. Simms.

The following indoor meetings were held:

17 Jan. Annual General Meeting & Presidential Address - "Reconstructing the Minoan island of Santorini", by Dr Peter Hardy (University of Bristol).

20 Feb. "There's an awful lot of fish in Brazil", by Dr David M. Martill (Open University).

20 Mar. "Degradation, decomposition and putrefaction - what *really* makes the world go round!", by Dr John Parkes (University of Bristol).

16 Oct. "Karst from the past - ancient and modern caves of Mendip", by Dr Michael J. Simms (University of Bristol).

20 Nov. "Explosive volcanic eruptions", by Prof. Stephen Sparkes (University of Bristol).

11 Dec. Members' Evening.

The following field meetings were held, under the leadership of those shown:

17 Mar. Dursley/Wotton-under-Edge area (joint meeting with Bath Geological Society), Dr N. Chidlaw.

5 May Bath Stone Quarry Museum, Corsham, Mr S. Carpenter.

22 Sep. Triassic and Jurassic Rocks of the South Wales coast (joint meeting with Cardiff Naturalists' Society), Mr S. Howe.

2 Nov. Geologists' Association Annual Reunion, University College, London, Mr S. Carpenter.

PETER R. CROWTHER, *Hon. Secretary.*

REPORT OF THE ENTOMOLOGICAL SECTION, 1991

No field meetings were held during 1991; the one indoor meeting attracted a respectable attendance but no offers to assist in maintaining a regular programme.

22 Apr. "Moths", by Mr G. Best.

RAY J. BARNETT

REPORT OF THE ORNITHOLOGICAL SECTION, 1991

At the 67th Annual General Meeting on 24 January Mr B. M. J. Gray succeeded Mr S. M. Taylor as President, and Mr R. Holmes succeeded Mr T. G. Evans as Hon. Secretary and Treasurer. Mrs M. Hamilton, Mrs J. Morgan and Mr R. L. Bland retired from the Committee; Dr and Mrs T. Wilton and Mr T. G. Evans were elected, and Mr Bland (BTO Regional Representative for Avon) was co-opted.

The autumn meetings were held at the United Reformed Church Hall, Redland, because of much increased charges at our former venue. Field meetings included two new areas - Salisbury Plain and the By Brook. Members contributed field work to the BTO's National Atlas of Breeding Birds, Birds of Estuaries Enquiry, national Heronry census and Severn Low Tide Survey, also to the Birds in Gardens and Over-wintering Warblers surveys and a study of Tawny Owls.

The following six indoor meetings were held:

23 Jan. Annual General Meeting and Presidential Address - "Surviving the winter", by Mr S. M. Taylor.

13 Feb. "An Australian journey", by Dr M. S. Kemp and "Some birds of Andalusia", by Dr H. E. Rose.

22 Mar. "Wetlands", by Mr J. Kirby.

11 Oct. "Harriers", by Mr R. Clarke (joint meeting with Hawk and Owl Trust).

15 Nov. "A Kenyan safari", by Mr P. J. Chadwick.

13 Dec. "The roof-nesting gulls of Bristol", by Mr P. Rock.

The following field meetings were held:

26 Jan.	New Grounds, Slimbridge.	5 Jun.	Chepstow Park Wood.
17 Feb.	Severn Beach.	12 Jun.	By Brook.
24 Mar.	Salisbury Plain.	14 Jul.	Clevedon coast.
20 Apr.	Portland & Radipole.	14 Sep.	Hinckley.
30 Apr.	Ashton Park.	19 Oct.	Chew Valley Lake.
4 May	Sand Point.	24 Nov.	Wentwood.
11 May	Cotswold Water Park.	26 Dec.	Severn Beach.
15 May	Snuff Mills, Stapleton.	28 Dec.	Dawlish Warren.
22 May	Leigh Woods.		

RICHARD HOLMES, *Hon. Secretary.*

LIBRARY REPORT, 1991

Library Committee members have continued to do routine work in the library; the post of Hon. Librarian has unfortunately remained unfilled. A new initiative was an appeal to members for references to articles and papers on local natural history, to be used to build up a classified index for use by members. We were grateful to receive lists of references from Mr P. Martin and Mr R. G. Symes.

The opening hours were maintained at Wednesdays 1.15 - 1.45 pm and Saturdays 10.15 am - 12 noon; 210 visits were paid by 35 members who borrowed 148 items, and 17 visits were made by Museum & Art Gallery staff. This year, five books have been purchased; 26 runs of journals (including reports and other serials) were received on subscription and 50 by exchange. Twelve books, seven reports and 32 journal issues were donated, for which we thank Mr P. J. M. Nethercott, Mr S. M. Taylor, Miss D. J. Vine, Mrs M. Duckett (books of the late Mrs D. A. Wills), Mrs J. H. Byrde, Mrs F. M. Vance, Mr R. G. Symes, English Nature and The Smithsonian Institution. Two natural history video tapes have been received as gifts.

We express the Society's gratitude to Mr M. Heighton (Director of Leisure Services, Bristol City Council) and Mrs H. Woolley (Assistant Director of Arts, Museums and Art Gallery) for the continuing use of the Library Room in 1991.

ANNE F. HOLLOWELL, *Chairman, Library Committee.*

OBITUARY: ADRIAN LEONARD GRENFELL (1939 - 1991)

Adrian Grenfell was born just before the Second World War, on 6 April 1939 and died early on 17 November 1991. It was well known that he had not been well and was taking things easier, but his death at only 52 while out jogging came as a shock to us all - only that week he had attended Society meetings, the last on the 15th, and had spoken to members on the telephone. He was keen on all aspects of the Society and attended General and Ornithological meetings in addition to those of the Botanical Section. Bristol and the UK has lost one of its great botanists.

I had known Adrian for many years, since we attended Cotham Grammar School together (although in different year groups). He was not then interested in botany - that was to come later, at about the time he met his wife Diana. At school he was interested in chemistry, and he left to start a career with the Gas Board. Later he changed direction to become an industrial chemist with a large Bristol company. Redundancy in 1980 allowed him to become a self-employed printer and then to establish a small publishing company (Grenfell Publications).

Adrian joined the Society in 1974 and soon became active botanically; from 1975 to 1991 he contributed many fine records to Bristol Botany, as published in the Society's *Proceedings*. By 1980 our alien and introduced plants had become a major interest, and his expertise with this difficult group came to be recognised nationally. From 1983 to 1991 he wrote the prestigious 'Alien News Section' of *BSBI News* for the Botanical Society of the British Isles. In 1982 he was elected a Fellow of the Linnean Society of London for his work on our alien flora.

Whilst busy with the national flora, Adrian continued to contribute to our Society. He produced interesting slides and exhibits each year at the Botanical Section's Members' Evenings, and his interest in foreign flora produced a talk at the 1986 Buffet Supper entitled 'A botanist in Greece' - an area that interested him (particularly Crete and Zakinthos) until he died. He knew the flora of dockland, his local Winterbourne and the Avon Gorge well, and lead many field meetings. Many members will happily recall that he was always pleased to help 'starters' by pointing out botanical characters on the more common plants - saying 'we all have to start sometime' - *and* the more experienced by showing them a rarity, a new hybrid or even something new to the British flora! So often his skilful eye had detected some difference and his determination would be confirmed by a specialist. The last field meeting he lead was in August 1991 to the Dundas Valley Viaduct near Bath. Here, amongst many other interesting plants we were shown Dodder (*Cuscata europea*) parasitic on nettles alongside the River Avon.

Adrian was Secretary of the Botanical Section twice, in 1979 - 1980 and then for a short time in 1991 before failing health caused him to pass the position on to Tony Smith. In 1986 - 1987 Adrian was Publicity Secretary for the Society, introducing many new ideas to help promote our activities and increase membership. From April 1989 to April 1991 he used his printing expertise to produce our monthly *Bulletin* (the 'yellow peril' as he called it). His publishing skills were used to produce the Society's *Proceedings* for a decade (Vols. 39 - 48). In particular, Vols. 47 and 48 were the first to be thematic issues, to have attractive colour covers and to be marketed as *Special Issues* to non-members through local bookshops.

Special Issue No. 1, *The Avon Gorge*, contained a paper by Adrian entitled 'A revision of the alien and introduced plants of the Avon Gorge' which has become a

classic for UK field botanists who visit that botanist's mecca. Other botanical works produced by Grenfell Publications were: *Supplement to the Flora of Gloucestershire* by S. C. Holland, H. M. Caddick and D. S. Dudley-Smith (1986); *The difficult and critical plants of the Lizard district of Cornwall* by L. G. Margetts (1988); and literature produced for the Linnean Society of London.

On a personal note, I must add that Adrian was a great companion and good friend. We visited many foreign and native locations together, and he was best man at my wedding to Helen. I always found him kind, helpful and considerate, and I know other people did as well.

Adrian is survived by his wife and son James, to whom we send sympathy.

TONY TITCHEN

STATEMENT OF ACCOUNTS FOR THE YEAR ENDED 31 DECEMBER 1991

Income and Expenditure for the year

1990	Income	*1991*
3657	Members' subscriptions	3872
373	Income tax repayment	366
201	Donations	235
1076	Sales of Proceedings and grants	2371
126	Sales of books and journals	162
116	General field meetings and Supper	425
654	Bank interest	536
6203		7967
	Expenditure	
1063	Printing and stationery	1032
548	Postage and telephone	854
1950	Proceedings and Bird Report	3703
65	'Bristol's Urban Ecology'	78
179	Library, books	171
30	binding	
230	subscriptions and journals	301
100	fire insurance	100
11	Donations	18
560	Indoor meetings	448
150	Grants to Sections	100
–	Bank charges	36
4886		6841
1317	Surplus on year	1126
6203		7967

Balance Sheet at 31 December 1991

1990		*1991*
5000	Income Bonds (National Savings)	5000
1045	National Savings Bank	1677
666	Cash at bank – current accounts	693
8316	– interest account	8579
–	Prepayment	–
15027		15949
4437	Less creditors (subscriptions in advance 345; Proceedings and reprints for 1990, 3189; room hire, 60)	3594
10590		12355
	Represented by :	
283	Harry Savory Illustrations Fund	288
165	Conservation Appeal	167
6045	Hector Hockey Memorial Fund	6677
630	R.G. Williams Memorial Fund	630
3467	General Fund at 31 Dec. 1990: 3467	
	Add surplus on year: 1126	4593
10590		12355

SPECIAL FUNDS

Receipts and Payments, year to 31 December

1990		*1991*
	Harry Savory Illustrations Fund	
283	Fund at 31 December 1990	283
	Donations to fund during 1991	5
283		288
	Conservation Appeal	
165	Fund at 31 December 1990	165
	Donations during 1991	102
		267
	Less three grants made	(100)
165		167
	Hector Hockey Memorial Fund	
6045	Fund at 31 December 1990	6045
	Year's investment income	687
	Less one grant made	(55)
6045		6677
	R.G. Williams Memorial Fund	
630	Fund at 31 December 1990 & 31 December 1991	630

NOTES TO THE ACCOUNTS

(1) No value is placed upon the contents of the Library and stocks of periodicals.

(2) These accounts do not record any balances held by sectional treasurers or the Ornithological Section's Special Fund of £657.62

(3) The Hector Hockey Fund is represented by the Income Bonds and National Savings Bank.

P. J. M. NETHERCOTT
Hon. Treasurer

7 July 1992

T. B. SILCOCKS
Hon. Auditor
7 July 1992

PAST PRESIDENTS

WILLIAM SANDERS	1862
HENRY E. FRIPP	1876
GEORGE FORSTER BURDER	1880
JOHN BEDDOE	1883
Professor WILLIAM RAMSAY	1884
Rev. THOMAS HINCKS	1887
Professor C. LLOYD MORGAN	1890
Professor ADOLPH LEIPNER	1893
Professor SYDNEY YOUNG	1894
S. H. SWAYNE	1897
Professor C. LLOYD MORGAN	1899
ARTHUR B. PROWSE	1901
C. K. RUDGE	1904
JAMES W. WHITE	1907
G. MUNRO SMITH	1910
Miss I. M. ROPER	1913
G. C. GRIFFITHS	1917
ERNEST (later Sir Ernest) H. COOK	1919
H. WOMERSLEY	1922
Professor O. V. DARBISHIRE	1924
JAMES RAFTER	1927
A. L. FLEMMING	1930
J. W. TUTCHER	1931
F. S. WALLIS	1933
Professor O. V. DARBISHIRE	1934
G. E. J. McMURTRIE	1935
Professor MACGREGOR SKENE	1938
H. TETLEY	1942
Sir LEWIS L. FERMOR	1945
F. W. EVENS	1948
H. H. DAVIS	1950
Professor W. F. WHITTARD	1952
J. H. SAVORY	1954
R. BASSINDALE	1956
Miss M. H. ROGERS	1958
F. COLES PHILLIPS	1960
H. H. DAVIS	1962
R. J. G. SAVAGE	1963
A. F. DEVONSHIRE	1965
F. R. STERNE	1966
R. BRADSHAW	1968
S. M. TAYLOR	1970
Mrs A. F. HOLLOWELL	1972
D. H. PEREGRINE	1974
D. HAMILTON	1976
J. F. W. McOMIE	1978
J. W. COWIE	1980
J. G. PRINCE	1982
V. DENNISON	1983
R. M. PAYNE	1985
T. E. THOMPSON	1987
Miss R. C. LEE	1989

Proceedings of the Bristol Naturalists' Society (1991), **51**: 15-20

AVON & DISTRICT ENTOMOLOGICAL REPORT, 1991

compiled by R. J. BARNETT

Bristol City Museum & Art Gallery, Queen's Road, Bristol BS8 1RL

INTRODUCTION

Enthusiasts for entomology continued to be members of a rare species in the Bristol region during 1991. However, the City Museum & Art Gallery's Bristol/Avon Regional Environmental Records Centre (BRERC) initiated two relevant mapping schemes for vice-counties 6 (North Somerset) and 34 (West Gloucestershire):

1, The Avon Butterfly Project seeks to monitor butterfly populations, with the joint aims of publishing an *Atlas* towards the year 2000 and of providing information so that nature reserves and other sites can be managed effectively for butterfly conservation. An inaugural meeting was held at Ashton Court Visitor Centre on 2 May.

2, An informal Avon Moth Group came into being at a meeting held at the City Museum & Art Gallery on 16 February. As with the Butterfly Project, the aim is to provide up-todate distribution maps for all species found in the district. Furthermore, data on the national rarities which are present are fed to the coordinator of the National Review of the Rarer Macro-moths at the Joint Nature Conservation Committee, Peterborough.

Another new group formed during 1991 is the Somerset Invertebrate Group. This is primarily concerned with the present-day county of Somerset and is closely linked to the Somerset Trust for Nature Conservation and the Somerset Environmental Records Centre.

Once again I am indebted to Mr A. H. Weeks for compiling the weather synopsis for 1991. As he reports, the year was fairly disappointing; but given the sheer number of insects that exist it is not surprising that some interesting records were nevertheless received. Two species that appear to have had particularly successful seasons are the green shieldbug *Palomina prasina* (as in 1990) and the Rose Chafer beetle *Cetonia aurata*. The Holly Blue butterfly *Celastrina argiolus* continued to be abundant but there were no confirmed sightings of the High Brown Fritillary *Argynnis adippe* which sadly may no longer occur in this region. Nationally, recorders reported a major immigration of moths in the autumn of 1991 but apart from large numbers of the Silver Y *Autographa gamma*, I received only two records of the Convolvulus Hawk-moth *Agrius convolvuli* and two of the Humming-bird Hawk-moth *Macroglossum stellatarum* in this area.

I am grateful to the following who sent me records for 1991: D. J. Agassiz, K. Alexander (KA), M. Bailey (MB), R. J. Barnett (RJB), G. Bennett, J. F. Burton, P. J. Chadwick, Mrs E. Clapson, D. Clements, R. S. Cropper (RSC), W. Dixon (WD), A. Duff (AD), M. Evans (ME), N. Goff (Woodspring Museum, Weston-super-Mare) (NG), L. Houston (LH), T. Hunt (TH), A. Pym, A. H. Weeks (AHW), C. Wilson (CWn) and C. Wiltshire (CWe). I have selected some of the more interesting for mention in this report.

Scientific nomenclature follows the checklists of Agassiz (1987), Bradley *et al.* (1972), Bradley & Fletcher (1979), Fitton *et al.* (1978), Pope (1977), Potts (1964) and Smith (1976).

WEATHER SYNOPSIS, 1991

1991 was rather cooler than the three preceding years, the mean temperature being 10·4°C, compared with 11·7°, 11·5° and 10·7° in 1990, 1989 and 1988 respectively. This drop was brought about by a colder winter and a disappointing summer. The year's rainfall totalled 734 mm, 84% of the long-term average, the same percentage as in 1990. Notable features are listed below (data compiled from a meteorological station at Yatton).

TABLE 1. Monthly and seasonal trends in climate during 1991.

	Monthly differences			*Seasonal differences*	
	Max. T°	*% Rain*	*% Sun*	*Max. T°*	*% Rain*
Dec.	−1·2	65	100		
Jan.	−0·5	138	117		
Feb.	−1·7	70	104	−1·1	90
Mar.	+1·8	96	90		
Apr.	−0·6	160	90		
May	−0·3	10	95	−0·3	84
June	−2·9	173	84		
July	−0·6	135	85		
Aug.	+1·0	15	120	−0·8	103
Sep.	+1·8	50	125		
Oct.	−0·9	80	85		
Nov.	−0·2	103	75	+0·3	76

The winter provided eight days of lying snow, one in January and seven in February, the first since the early months of 1987. [A day of snow is one in which more than 50% of the ground is covered at 9.00 am.] The incidence of frost was much higher, with 32 air frosts and 48 ground frosts in the 90 days, compared with five and 22 in the previous winter.

April was exceptionally wet, while May was exceptionally dry with only 6·0 mm of rain, the third successive very dry May and the fifth with rainfall below average. June and July were particularly wet, cooler than average and deficient in sunshine; there were 22 rain days and 3-4 June had the dubious distinction of providing an overnight frost (air minimum -0·8°C, ground minimum -2·3°C).

The summer was 'rescued' by a very fine August, again the third in a row with below-average rainfall.

The wettest days were 9 October (25·1 mm in 24 hrs from 9.00 am), 17 July (23·2 mm) and 29 April (22·1 mm), although in the latter two cases most fell overnight.

SPECIES OF NOTE IN 1991

LEPIDOPTERA (butterflies)

Dingy Skipper *Erynnis tages* (L.) Cheddar Wood ST4854 3 June (CWn).

Grizzled Skipper *Pyrgus malvae* (L.) Batcombe Hollow, Draycott Sleights ST4751 27 May (RSC); Cheddar Wood ST4854 3 June (CWn).

White Letter Hairstreak *Strymonidia w-album* (Knoch) Combe Dingle ST5577 8 August (RJB).

Chalkhill Blue *Lysandra coridon* (Poda) Draycott Sleights ST4851 27 July (RJB, RSC); Uphill ST3158 17 August (NG).

Dark Green Fritillary *Argynnis aglaja* (L.) Charterhouse ST5056/ST5057 27 July (AHW); Sand Point ST3265 12 August (RJB).

The Grayling *Hipparchia semele* (L.) Brean Down ST2858 11 August (RSC).

LEPIDOPTERA ('macro'-moths)

Small Eggar *Eriogaster lanestris* (L.) Sand Point ST3266 30 June, larvae (ME); Flax Bourton ST5069/ST5070 30 July, larvae (CWe).

Barred Hook-tip *Drepana cultraria* (Fabr.) Leigh Woods NNR ST5573 26 May, to light (RJB *et al.*); Tyning, Timsbury ST659587 no date, to light (MB).

The Mocha *Cyclophora annulata* (Schulze) Leigh Woods NNR ST5573 26 May, to light (RJB *et al.*).

Chalk Carpet *Scotopteryx bipunctaria* (D. & S.) Stinchcombe Hill ST7398/ST7498 12 August (CWe); Avon Gorge ST5674 17 August (CWe).

Little Thorn *Cepphis advenaria* (Hb.) Leigh Woods NNR ST5573 26 May, to light (RJB *et al.*).

Brindled White-spot *Paradarisa extersaria* (Hb.) Leigh Woods NNR ST5573 26 May, to light (RJB *et al.*).

Convolvulus Hawk-moth *Agrius convolvuli* (L.) Yatton ST46 24 September (Mr Street *per* RJB); Grace Road, Weston-super-Mare ST3663 27 September (NG).

Antichloris sp. Bristol Road, Churchill ST4560 2 August (pupa discovered on bananas and moth emerged same day) (Mrs Atherton *per* RJB).

Light Feathered Rustic *Agrotis cinerea* (D. & S.) Tyning, Timsbury ST659587 no date, to light (MB).

Lunar Yellow Underwing *Noctua orbona* (Hufn.) Sand Point ST325661 22 July, to light (ME).

Dotted Chestnut *Conistra rubiginea* (D. & S.) Tyning, Timsbury ST659587 no date, to light (MB).

Marbled Green *Cryphia muralis* (Forst.) Midsomer Norton ST 659543 2 August, to light (TH); Tyning, Timsbury ST659587 no date, to light (MB).

Old Lady *Mormo maura* (L.) Cribbs Causeway, Bristol ST570801 18 August, flew into house (CWe).

Small Dotted Buff *Photedes minima* (How.) Black Rock Villas, Portishead ST4574 no date, to light (WD).

LEPIDOPTERA ('micro'-moths)

Adela rufimitrella (Scop.) Leigh Woods NNR ST5573 26 May, swept (RJB).

Psyche casta (Pallas) Leigh Woods NNR ST5573 26 May, larva swept (RJB).

ODONATA (dragonflies)

Red-eyed Damselfly *Erythromma najas* (Hanse.) Chilton Moor ST3742/ST3842 20 July (RSC).

ORTHOPTERA (grasshoppers and crickets)

Slender Groundhopper *Tetrix subulata* (L.) South Moon Riding, Lower Woods ST7488 16 April, swept (RJB); Batcombe Hollow, Draycott Sleights ST4852 27 May (RSC).

Stripe-winged Grasshopper *Stenobothrus lineatus* (Panz.) Compton Martin ST5256 27 July (RSC); Barrow Hill, Great Elm ST7450 25 August (RSC).

Woodland Grasshopper *Omocestus rufipes* (Zett.) Great Elm ST7448 25 August - second site for Somerset (RSC).

Rufous Grasshopper *Gomphocerippus rufus* (L.) Hay Hill, Coxley ST5244 24 August; Fenny Castle Hill, Yarley ST5043 24 August; Huckham Hill ST4435 31 August; Collard Hill ST4834 31 August; Cock Hill ST3738 7 September; Socombe Hill ST3838 7 September; Ball Hill ST3637/ST3737 7 September; Draycott Sleights ST4851 14 September; Breach Hill, Chew Stoke ST5459/ST5460 21 September (all records RSC).

DIPTERA (flies)

Asilus crabroniformis L. Huckham Hill ST4435 31 August (RSC).

Volucella zonaria (Poda) Horfield, Bristol ST5978 8 July (Mr & Mrs Walker *per* RJB)

HYMENOPTERA, SYMPHYTA (sawflies)

Solomon's Seal Sawfly *Phymatocera aterrima* (Klug) Leigh Woods ST5574 5 July, larvae on *Polygonatum odoratum* (also seen 23 June 1990) (LH); Bishop Sutton ST55 8 July (larvae) (Mrs Mann *per* RJB); Bishopston, Bristol ST5875 no date, larvae (RJB).

COLEOPTERA (beetles)

Cicindela maritima Lat. & Dej. Berrow dunes ST2951 29 June (RSC).

Plegaderus dissectus Erich. Ashton Court ST5471 19 May - first record for 'Somerset', v.c. 5 & 6 (KA).

Silpha laevigata Fabr. Nyland Hill ST4550 27 July (RSC).

Acidota cruentata Mann. Long Ashton ST544697 9 December, pitfall trap (CWe); Flax Bourton ST503701 23 December - first and second records for 'Somerset', v.c. 5 & 6 (CWe).

Lathrobium pallidum von Nord. Long Ashton ST544697 9 July and 12 August, pitfall traps (CWe).

Ontholestes tesselatus (Fourc.) Long Ashton ST544697 9 September, pitfall trap (CWe).

Sepedophilus marshami (Steph.) Long Ashton ST544697 9 September, pitfall trap (CWe).

Ilyobates subopacus Palm Long Ashton ST544697 9 September, pitfall trap (CWe).

Euplectus duponti Aube Long Ashton ST544697 12 August, pitfall trap - first record for 'Somerset', v.c. 5 & 6 (CWe).

Rose Chafer *Cetonia aurata* (L.) Berkeley Square, Clifton ST5772 15 April to 11 July (RJB); Palmer Street, Weston-super-Mare ST3261 23 May (NG); Burrington Combe ST477583 3 June (CWn).

Stenagostus rhombeus (Oliv.) Ashton Court ST5471 19 May - second record for 'Somerset', v.c. 5 & 6 (KA).

Glow-worm *Lampyris noctiluca* (L.) Dolebury Warren ST449589 27 March, larva under stones (RJB); Crook Peak ST3855/ST3955 10 July (130 counted) (RSC).

Orange Ladybird *Halyzia 16-guttata* (L.) Leigh Woods NNR ST5573 12 July, to light (RJB).

Enicmus brevicornis (Mann.) Ashton Court ST5471 19 May - first record for 'Somerset', v.c. 5 & 6 (KA).

Opatrum sabulosum (L.) Brean Down ST2958 14 April - only current site known in Somerset (RSC).

Gonoderus luperus (Herbst) Leigh Woods NNR ST5573 26 May (AD).

Cteniopus sulphureus (L.) Avon Gorge ST565730 17 July (LH); Sand Point ST325661 12 August (RJB).

Meloe proscarabaeus L. Brean Down ST2858 14 April (RSC).

Anaglyptus mysticus (L.) Leigh Woods NNR ST5573 26 May (AD).

Rhynchites cavifrons Gyll. Ashton Court ST5471 19 May - first record for 'Somerset', v.c. 5 & 6 (AD).

Cionus tuberculosus (Scop.) Cheddar ST4754 21 July (RSC).

REFERENCES

AGASSIZ, D. J. L. (1987). *Addenda and corrigenda to: A recorder's log book or label list of British butterflies and moths.* Colchester, Harley Books.

BRADLEY, J. D. & FLETCHER, D. S. (1979). *A recorder's log book or label list of British butterflies and moths*. London, Curwen Books.

BRADLEY, J. D. *et al.* (1972). *Kloet & Hincks, A checklist of British insects, Part 2. Lepidoptera*. London, Royal Entomological Society.

FITTON, M. G. *et al.* (1978). *Kloet & Hincks, A checklist of British insects, Part 4. Hymenoptera* (2nd edition, revised). London, Royal Entomological Society.

POPE, R. D. (1977). *Kloet & Hincks, A checklist of British insects, Part 3. Coleoptera and Strepsiptera* (2nd edition, revised). London, Royal Entomological Society.

POTTS, W. H. (1964). *Kloet & Hincks, A checklist of British insects, Part 1. Small Orders and Hemiptera* (2nd edition, revised). London, Royal Entomological Society.

SMITH, K. G. V. (1976). *Kloet & Hincks, A checklist of British insects, Part 5. Diptera and Siphonaptera* (2nd edition, revised). London, Royal Entomological Society.

CORRECTION TO 1990 REPORT

Cantharis fusca (L.) The entry should read: Walton Moor ST4373 10 May, taken in flight (RJB).

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AVON MAMMAL REPORT, 1991

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INTRODUCTION

This is the third recent Mammal Report for Avon (Symes & Trump, 1991, 1992). Its purpose is to serve as a register of the increasing interest in the study of wild mammals in Avon from scientists, naturalists, conservationists, veterinarians, pest controllers and many others.

REPORTS ON MAMMALS

INSECTIVORA (hedgehogs, moles and shrews)

Hedgehog *Erinaceus europaeus*. The Mammal Society Hedgehog Road Kill Survey continued in 1991 with, nationally, sixty-one observers contributing records. Dr Pat Morris reported (pers comm.) that just over 1,300 hedgehogs were seen in 91,000 miles. The South West region of the survey, which includes Avon, had a figure of 1·4 hedgehogs recorded per 100 miles driven (2·04 per 100 miles in 1990). Nationally, a quarter of all the records were from the 'urban' habitat category. The survey continues in 1992.

Shrews *Sorex* spp. See sections below on 'Small Mammal Trapping' and 'Small Mammals and Barn Owls'.

CHIROPTERA (bats)

The National Bat Habitat Survey begun in 1990 continues (S. Harris *et al.*, University of Bristol). Routh (1991) produced a guide to the treatment of injured bats.

Bat records for Avon in 1991 have been compiled by Dr Gareth Jones, Department of Zoology, University of Bristol, and the Avon Bat Group. Contributors: Gareth Jones (GJ), Jim Jayne (AFJ), David Trump (DPCT), Robert Cropper (RC), Laurent Duvergé (PLD), Simon Garrett (SG), Diana Desmond (DD), Mark Brookes (MB), David Clarke (DC), Simon Christian (SC), Paul Coope (PC).

Pipistrelle *Pipistrellus pipistrellus*. Male, dead, opposite Students' Union, Clifton, Bristol ST5772 on 14 July (SG). Abandoned young found at High St, Portishead ST4676 on 18 July, and Brockley ST4767 on 22 July. Male killed by cat, Merlin Park, Portishead on 7 August. Bat detector records from Staple Hill ST6757 on 14 April (45 kHz echolocation), Clifton Down ST5675 (45 kHz) during July, and Abbots Pool ST5373 on 8 September (45 and 55 kHz). The presence of pipistrelles with both 45 and 55 kHz tails to their echolocation calls is perplexing and is under investigation by GJ. An abandoned baby pipistrelle hand-reared by DD was still alive in January 1992. This was one of seven found abandoned at Coalpit Heath ST6781 on 12 July. Summer roosts counted by AFJ: 70 including young at Bath ST7265 on 13 August; 80 at Clapton-in-Gordano ST4773 on 19 July; 149 at

Bathampton ST7766 on 11 July; 200+ Limpley Stoke ST7760 on 16 July. One at Farleigh Hungerford ST8058 on 22 May died after spraying by a pest control company. 131 bats reported coming out of a house roof in Nailsea ST4669 in June (DPCT). Nursery roosts at Oldland Common ST6171 with 31 bats counted out on 21 July (AFJ). Other records from ST4870, 5178, 5280, 5477, 6067, 6072, 6274, 6357, 6372, 6374, 6672, 6781 and 6881 (all AFJ).

Nathusius's pipistrelle *Pipistrellus nathusii*. A bat brought to GJ from Avonmouth ST5277 on 27 September was a female of this species. It had a forearm of 36·2 mm and a body mass of 6·0 g, and had been found under rubble in a garden. It was badly injured and died several days after being found. The proximity of the bat to Avonmouth raises the possibility that the animal reached British shores by boat, and flew when the boat docked. The timing of the record coincides with the migratory period of this species in continental Europe, however, and most of the previous British records to the end of 1989 were from September (Speakman *et al.*, 1991). It is therefore likely that the bat was a vagrant, overshooting its winter migratory flight. The Avonmouth bat had the longest forearm of any British bat of this species yet measured. This is a new record for Avon and only the fifteenth for Great Britain.

Leisler's bat *Nyctalus leisleri*. A feeding site for this species has been identified on Clifton Down ST5675 where a bat was seen and recorded in July. One male found by DPCT at Stoke Bishop ST5676 on 2 October was released at site of capture. This species is now recorded annually in Avon, and a nursery site must surely be found in residential Bristol in the near future.

Noctule *Nyctalus noctula*. Spring colonies found at Frome Valley near Fishponds (MB), and near Winterbourne (up to 90 bats) (AFJ). A colony also at Shirehampton golf course ST5377 (DC). A roost of bats fitting the description of this species at Knowle ST6071. All of these colonies were in trees. At the Winterbourne site GJ recorded a wide variety of social noises, some extending into our hearing range. Injured bat at Portbury ST5075 in the spring. Bat detector records from Clifton Down (up to 10 bats, June-July) and Puxton ST4162 (GJ), and also Leigh Woods ST5573 on 26 May and Bathampton ST7766 on 12 July (AFJ).

Serotine *Eptesicus serotinus*. The Blagdon nursery roost is still occupied. Elsewhere recorded from Clapton Church, where a single individual roosts. Detector record from Winterbourne Down ST6579 on 10 May (AFJ).

Daubenton's bat *Myosotis daubentonii*. Bat detector record from the rhynes at Puxton ST4162 (GJ). A female was caught on a fishing line at Saltford on 10 October (AJF).

Natterer's bat *Myosotis nattereri*. No records for 1991.

Whiskered/Brandt's bat *Myosotis mystacinus/brandtii*. One found injured at Combe Down ST7662 on 23 April (AFJ). A Brandt's bat was hibernating in East Harptree on 6 January (RC).

Bechstein's bat *Myotis bechsteinii*. A female of this species was found hanging from a wall in Bedminster shopping centre ST5871 on 26 September by AFJ. It had apparently been in the same spot for several days. It was subsequently released in a wooded river valley on the Avon/Wiltshire border. This is the first record for Avon of a species which is typically associated with forested habitats.

Brown long-eared bat *Plecotus auritus.* Sandford ST4259 on 1 January (RC); Banwell on 6 January; Combe Down on 15 January; male at Stoke Gifford ST6279 on 10 July (GJ). One in unlit wood-burning stove at Henfield ST6779 on 27 July; one rescued from River Avon at Keynsham ST6568 on 26 August (AFJ); male at Barrow Common ST5568 on 25 September (GJ); at least six in roof at Priston ST6961 on 12 October (AFJ); one at Woodspring Priory around Christmas (per GJ).

Greater horseshoe bat *Rhinolophus ferrumequinum.* The habitat requirements of this species are currently being studied by radio-tracking in a project based at the University of Bristol. PLD has been tracking bats from a major breeding colony over the summer in a project funded by the Vincent Wildlife Trust. The spring of 1991 was delayed, and breeding was slightly later than 1990's early birth dates. About 24 babies were born at the underground breeding site, fewer than in 1990. Bats reoccupied a traditional breeding site in old stables for the first time since 1988; babies were heard and up to 36 bats counted out. The return of the bats to this site is a major conservation achievement since the stables were converted into living accommodation, with roof space left for the bats, in 1988-1989. It is clear that traditional nursery roosts of this species may still be used if renovation work is performed carefully, though bats may not return for several years. At another nursery site on the Wiltshire border, up to 276 bats were present at one time with about 70 babies born. A spring site in the Gordano valley held only a maximum of 12 bats this summer, with bats arriving on 15 April. One bat found dead at Walton-in-Gordano was born on 17 July 1987 at the Avon stable nursery site, and wintered regularly at Wookey. Another was found dead at Hinton Charterhouse ST7858 during the first week of August (per Bristol City Museum).

Lesser horseshoe bat *Rhinolophus hipposideros.* Fourteen in mines in the north-west of the county on 5 April. Maximum count of 51 in south-western stone mines, January. Two bats at Abbot's Pool on 8 September. One of these flew from a cave uttering repeated low-frequency vocalisations. This behaviour has not been reported in the literature, and suggests that the cave may have been used as a mating site (GJ). One found dead near Dolebury Warren ST4558 on 21 June (PC). Six at a barn near Blagdon ST4959 on 10 October (AJF).

Short-nosed fruit bat *Cyanopterus brachyotis.* A bat found dead in a bundle of ramin wood at Avonmouth on 14 August 1990 was identified as being of this species by J. E. Hill, formerly of the British Museum (Natural History). The bat arrived on a ship which began its journey in south-east Asia (probably Borneo) (DC, GJ).

LAGOMORPHA (rabbits and hares)

Brown hare *Lepus europaeus.* A National Brown Hare Survey is under way, with funding from the Joint Nature Conservation Committee. The fieldwork, which started in October 1991, involves walking a transect through selected 1 km squares on three occasions between October and January. The survey is co-ordinated by S. Harris and M. Hutchings at the Department of Zoology, University of Bristol.

A private Member's Bill to ban Hare Coursing was read for a second time (*Hansard*, 26 April 1991). There is no evidence to link European Brown Hare syndrome with the grazing of "double low" varieties of oilseed rape and it is now considered that a virus is the most likely cause (*Hansard*, 7 May 1991, WA 386).

RODENTIA (rodents)

Common rat *Rattus norvegicus.* Mr R. Bevan (Pest Control Manager, Bristol City Council) reported a continuing decline in the number of complaints about rats, with 1,074 cases investigated (1,113 in 1990). This was attributed to the continuing programme of sewer baiting.

Black rat *Rattus rattus.* Graham Twigg reported on the results of the Black Rat Survey (*Mammal News*, No. 84). Between 1971 and 1980 there were several records of black rats around the Bristol Channel. Since then, apart from very occasional records from ports such as Avonmouth, the nearest known population is on Lundy Island.

House mouse *Mus domesticus.* Mr R. Bevan (Pest Control Manager, Bristol City Council) reported a decline in numbers of house mouse complaints from 1,657 in 1990 to 1,319 in 1991.

Dormouse *Muscardinus avellanarius.* Paul Bright (Conservation Officer, Mammal Society) continues to develop conservation strategies for dormice through nest box schemes, woodland and hedgerow management and re-introduction schemes.

Red squirrel *Sciurus vulgaris.* Mr R. C. Budden (District Manager for Wiltshire and Avon, Forestry Commission) reported little change in red squirrel distribution - the nearest red squirrels to Avon being on the Isle of Wight, Brownsea Island and in mid Wales.

Grey squirrel *Sciurus carolinensis.* Grey squirrel numbers in Avon were reported to be high throughout the year due to populations over-wintering well with plentiful food supplies. The Forestry Commission are still very concerned about squirrel damage to young hard-wood trees. Owners of ancient woodlands can now claim grants for managing these woods - grey squirrel control being one of the main requirements. John Burton reported on two cases of grey squirrels being repeatedly "attacked" by a carrion crow and a magpie.

SMALL MAMMALS

Small mammal trapping. Trapping continued for the ninth year at the ADAS hedgerow sites (Trump, 1991). The 1991 results were as follows (with the 1990 figures in parentheses): spring captures, woodmouse 3 (1), bank vole 2 (8), common shrew 0 (3); autumn captures, woodmouse 67 (35), bank vole 3 (5), common shrew 3 (5).

Small mammals and barn owls. Chris Sperring (Conservation Officer, Hawk and Owl Trust) reported on the importance of rough grassland for small mammals, especially field voles, and hence the value of these habitats as hunting grounds for barn owls, short-eared and long-eared owls. Analysis of barn owl pellets collected in Avon revealed that field voles formed between 19% and 70% of prey items, depending on the location and time of year. Common shrews also form an important part of the barn owl diet (up to 60%). Small mammals recorded from barn owl pellets in Avon so far include short-tailed field vole, bank vole, woodmouse, pygmy shrew and common shrew.

Farmers are actively being encouraged to leave rough grassland strips around fields to provide hunting grounds for barn owls as well as other birds of prey.

CETACEA (whales and dolphins)

The Irish Government has declared the seas around Ireland as a Whale and Dolphin Sanctuary (*Mammal News*, No. 87). A national scheme to monitor the incidence of accidental catches by fishermen of marine mammals was announced by the Fisheries Departments of the United Kingdom, to commence on 1 January 1992 (*MAFF News Release*, No. 468/91).

CARNIVORA (carnivores)

Badger *Meles meles*. Philippa Burrell of the Avon Badger Group reported on the group's activities for the year, including rescuing and tending injured badgers, advising land owners and others on badger damage to gardens, and development and planning issues. Between 1991 and 1993 a National Survey will determine the levels of badger persecution. Bristol has been chosen as the "urban" persecution study area. Bristol University is coordinating the survey nationwide and the collection of data locally is to be done by the Avon Badger Group. It is intended to survey all of Bristol's badger setts. Work continues to survey the rest of the setts in the county; currently around 400 are known. A badger hot line has been set up by the Avon Badger Group and the Avon Wildlife Trust for members of the public to report badger "accident black spots" (*Bristol Evening Post*, 10 September 1991).

Figures for 1989 show that nationally 63 defendants were prosecuted under the Badgers Act 1973, resulting in 52 being convicted and fined. In 19 cases the defendants were fined between £200 and £300. Two cases resulted in fines of £1000 (*Hansard*, 21 October 1991, WA 338). An amendment to the Badgers Act 1973 came into force on 25 October 1991. In addition to the protection already offered the new act makes it an offence to: *a*, damage a badger sett or any part thereof; *b*, destroy a badger sett; *c*, obstruct access to or any entrance of a badger sett; *d*, cause a dog to enter a sett; and *e*, disturb a badger when it is occupying a badger sett. Licences to "interfere with badger setts" may on occasion be granted by the Ministry of Agriculture, Fisheries and Food or English Nature, depending on the particular circumstances involved.

In response to a question on live tests for bovine tuberculosis, the Minister of Agriculture stated that field trials had only just begun, having been delayed by bad weather. The trials are expected to last 12 months (*Hansard*, 7 March 1991, WA 257). The number of badgers killed as part of official badger removal operations in 1990 was 811; the figure for 1991 was 771 (up to 17 October), from an estimated total badger population of 350,000. It is thought that some 20,000 badgers are killed each year in road accidents (*Hansard*, 17 October 1991, WA 238).

Fox *Vulpes vulpes*. Numerous sightings of foxes from all parts of Bristol were reported. Trewhella *et al.* (1991) evaluated the uptake of baits by foxes in three different areas of Bristol. The numbers of baits taken increased steadily from January/February to September/October, with a slight decrease at the end of the year. The proportions of bait taken in different habitats varied considerably (24% from "front gardens" to 74% from "public open spaces"). Using a marker in the bait they showed that, during the summer months, 35% of the adult foxes had taken the bait (the figure for the winter was 29%). A doubling of numbers of baits available per fox resulted in a proportionate increase in uptake per fox. Mathematical models predict that it would be necessary to achieve at least 75% control levels to prevent

the spread of a rabies outbreak. These results suggest that in the event of such an outbreak the currently planned baiting strategy is unlikely to be effective.

Various research projects on foxes in Avon are currently underway at the University of Bristol. These include "Parental investment in foxes" (S. Harris and P. Baker), "Strategies for distributing baits to foxes and badgers" (G. Saunders) and "Contact rates and social behaviour of urban foxes in relation to the transmission of rabies (S. Harris and P. White).

In their 1991 review the Game Conservancy rate the fox as "our most serious game predator in all habitats". Their National Game Bag Census revealed an average of 2·5 foxes killed per square km - the figure for Avon being about the national average (Tapper & France, 1992).

Otter *Lutra lutra*. The work of the Wessex Otter Conservation Project administered by the National Rivers Authority continues. The project is divided into three phases: 1, the collation of historical information; 2, a survey of the current distribution of otters in Dorset, Wiltshire, Avon and Somerset; and 3, habitat restoration and enhancement. Any information on otter distribution and movements should be sent to the Otter Conservancy or the NRA. The Vincent Wildlife Trust began the third National Otter Survey in 1991, its aim being to investigate the distribution and changing status of otters in England.

Mink *Mustela vison*. The National Game Bag Census for 1991 shows that nationally 0·18 mink were killed in every square km (Tapper & France, 1992), while the figure for Avon is 0·1 - 0·5 mink per square km. The number of mink farms in England and Wales as of 20 February 1991 was 25, 18 fewer than a year previously. There are currently no mink farms in Avon (*Hansard*, 22 February 1991, WA 318).

PINNIPEDIA (seals)

The Sea Mammals Research Unit in Cambridge are currently involved in the study of the distribution and population dynamics of seals in British waters. Accidental catches of seals by fishermen are to be monitored by the Fisheries Departments in the United Kingdom (*MAFF News Release*, No. 468/91).

ARTIODACTYLA (deer)

J. R. and R. E. Best, veterinary surgeons in Portishead, noted that for the first time in ten years they had treated roe deer (*Capreolus capreolus*) casualties, both from dog attack and road accidents. They also reported many roe deer sightings in the Gordano area.

English Nature (formerly the NCC) submitted to the Department of the Environment a list of species it considered should be added to Schedule 9 of the Wildlife and Countryside Act (1981). (Schedule 9 species are those which are introduced to the UK and inclusion in the Schedule would in effect prohibit the release or escape into the wild of those species.) The only two mammals on the list are the muntjac (*Muntiacus reevesi*) and the sika deer (*Cervus nippon*) (*Mammal News*, No. 85). Muntjac have been recorded in the Castle Combe area in Wiltshire and near Stroud in Gloucestershire (Arnold, 1984). There are no records of sika deer in Avon.

In response to a written question in the House of Commons, the Minister of

Agriculture gave the numbers of deer culled in each of the Forestry Commission's conservancies in England, Scotland and Wales. The figures for the West of England Conservancy for the year up to 31 March 1990 were as follows (figures for the whole of Great Britain in parentheses):

Sika deer	33	(973)	Roe deer	164	(11,221)
Fallow deer	540	(3,724)	Red deer	61	(6,334)
Muntjac	14	(356)			

The Deer Act 1991, which consolidates all legislation concerning deer, came into force on 25 October 1991.

GENERAL MAMMAL NEWS

The 3rd edition of *The handbook of British mammals* was published (Corbet & Harris, 1991). The Mammal Society produced fact sheets on 18 mammals: dormouse, hedgehog, red squirrel, badger, brown hare, otter, fox, common and grey seal, wildcat, pine marten, water vole, weasel, woodmouse, roe deer, mole, rabbit and bottle-nosed dolphin. Copies of all these and the *Handbook* may be found in the Society's Library. Paul Bright (Conservation Officer, Mammal Society) continues to produce the list of *Current projects on British mammals*; it is updated annually in the autumn.

MAMMAL RECORDING

Philippa Burrell, the Bristol/Avon Regional Environmental Records Centre Administrator, reported on their work. They are currently involved in the collection, management and dissemination of information on the status and distribution of mammals in Avon. In 1991 particular emphasis was placed on the collection and management of badger records - both setts and road casualties. BRERC have advised the Avon Bat Group on the computerisation of their bat records.

CHANGES IN LEGISLATION

See under species accounts. A Bill to protect wild mammals from cruelty was published on 4 December 1991.

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(Assistant Conservation Officer for Avon, English Nature), Richard Bradford (Conservation Officer for Avon, English Nature), Andrew McDouall (Species Protection Officer, English Nature), Lynn Garvey (Enforcement Coordinator, Department of the Environment), Anthony Merritt (Conservation Officer, Avon Wildlife Trust), Richard Bevan (Bristol City Council Pest Control Services Manager), Chris Sperring (Conservation Officer, Hawk and Owl Trust), Mr R. C. Budden (Forest District Manager, Avon and Wiltshire, Forestry Commission), Roger Symes (Wildlife Biologist, ADAS), Lyn Jenkins, (Regional Conservation Officer, National Rivers Authority, Wessex Region), J. R. Best, Des Bowring, John Burton and Paul Chadwick.

REFERENCES

ARNOLD, H. R. (ed.) (1984). *Distribution maps of the mammals of the British Isles*. Monks Wood, Institute of Terrestrial Ecology.

CORBET, G. B. & HARRIS, S. (eds) (1991). *The handbook of British mammals* (3rd edition). Oxford, Blackwell Scientific Publications.

ROUTH, A. (1991). Bats in the surgery: a practitioner's guide. *Veterinary Record*, 6 April 1991, pp.316-318.

SPEAKMAN, J. R., RACEY, P. A., HUTSON, A. M., WEBB, P. I. & BURNETT, A. M. (1991). Status of Nathusius's pipistrelle (*Pipistrellus nathusii*) in Britain. *Journal of Zoology*, 225, 685-690.

SYMES, R. G. & TRUMP, D. P. C. (1991). Avon Mammal Report 1989. *Proceedings of the Bristol Naturalists' Society*, 49, 19-30.

SYMES, R. G. & TRUMP, D. P. C. (1992). Avon Mammal Report 1990. *Proceedings of the Bristol Naturalists' Society*, 50, xxi - xxx.

TAPPER, S. & FRANCE, J. (1992). National Game Bag Census. *Game Conservancy Review* 1991, 23, 38-40.

TREWHELLA, W. J., HARRIS, S., SMITH, G. C. & NADIAN, A. K. (1991). A field trial evaluation of bait uptake by an urban fox (*Vulpes vulpes*) population. *Journal of Applied Ecology*, 28, 454-466.

TRUMP, D. P. C. (1991). Small mammals in a species-rich hedgerow in Avon. *Proceedings of the Bristol Naturalists' Society*, 49, 43-54.

Proceedings of the Bristol Naturalists' Society (1991), **51**: 29-40

BRISTOL BOTANY IN 1991

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After two years with above normal temperatures and dry summers, 1991 had fairly average weather. Temperatures overall were about normal, the mean maximum being 0·8°C lower and the mean minimum 0·4°C higher than usual. February was distinctly cold with temperatures some 2·5°C below average. In the first three months of the year there were 48 ground frosts as compared with only five for this period in 1990. The total rainfall was 896·3 mm (about 103% of average), June being cool and exceptionally wet (148·1 mm) with more than double the normal rainfall. On the other hand May, August and December were very dry months.

Not surprisingly, vernal species came into flower some three or four weeks later than in 1990. *Daphne laureola* was at its best at Brent Knoll in late February and also *Erophila verna* on Brean Down (RSC). In early April *Gagea lutea*, a notoriously shy flowerer, was in golden colour in Littleton Wood, Dyrham, and there were also a few flowers at Grandmother's Rock (RSC). 1991 was a good year for a number of other species: *Hornungia petraea* flowered profusely in the Avon Gorge (LH), *Trinia glauca* on Compton Hill (PJMN) and *Cyperus fuscus* was flourishing in the Gordano Valley (RSC). With revised management of Clifton and Durdham Downs (some areas formerly mown being allowed to grow freely), many showy plants, previously flowering sparsely if at all, were conspicuous. The limestone flora has recovered to a noticeable extent, with abundant flowering, for example, of *Filipendula vulgaris, Galium verum, Helianthemum chamaecistus, Origanum vulgare* and *Pimpinella saxifraga* (JFB). Also seen flowering there, after a lapse of many years, was *Anacamptis pyramidalis*. This enhancement of the vegetation is leading to a recovery of the butterflies, with Meadow Browns and Marbled Whites being more plentiful than usual (JFB). After the abundant fruiting of *Sorbus aria* and its allies in 1990, there was hardly any fruiting in 1991 (PJMN). An assessment was made, however, partly with the aid of field glasses, of the *Sorbi* in the path of the heavy rockfall in April 1985 at the Great Fault of the Avon Gorge. *Sorbus eminens* suffered severely, nearly all the shrubs being destroyed, but a very few still survive and also a small sapling (probably post-1985). *Sorbus porrigentiformis*, although damaged, fared better as the shrubs were generally not in the path of the main rockfall (PJMN).

A detailed account of the history and performance of several species of *Allium* in the Avon Gorge is given by L.C. Frost, L. Houston, C.M. Lovatt and A. Beckett in a paper entitled '*Allium sphaerocephalon* L. and introduced *A. carinatum* L., *A. roseum* L. and *Nectaroscordum siculum* (Ucria) Lindley on St Vincent's Rocks, Avon Gorge, Bristol' (*Watsonia*, 1991, Vol. 18, pp. 381-385). The infection of all these species with the rust fungus *Puccinia allii*, new records for Britain, is also reported. Details are given in 'New host records for *Puccinia allii* Rud.' by A. Beckett, L. Houston and L.C. Frost in *Plant Pathology*, 1992, Vol. 41, pp. 83-85. Heaviest infection was in *Allium sphaerocephalon* (showing uredinia and telia); *Nectaroscordum siculum* has never been previously recorded as infected by *Puccinia allii*, formerly regarded as host specific. The discovery in 1990 of the Lady Orchid in Leigh Woods, its distribution and some features of its ecology, are

described in the article '*Orchis purpurea* Hudson in the Avon Gorge, Bristol' by A.J. Willis, M.H. Martin and K.B. Taylor (*Watsonia*, 1991, Vol. 18, pp. 387-390). An account of the salt marsh at Berrow by A.J. Willis entitled 'The development and vegetational history of Berrow salt marsh' was included in these *Proceedings*, 1992 (for 1990), Vol. 50, pp. 57-73.

Many noteworthy plant records were made in 1991. The dune system at Berrow, in spite of being quite well studied over many years, yielded two of considerable interest: the Lizard Orchid and the grass *Poa bulbosa*, the former not previously recorded there and the latter a new record for v.c.6. The find of the Glasswort *Salicornia obscura* at the Royal Portbury Dock and also Avonmouth Docks constitutes not only new records for both v.c.6 and v.c.34 but also the first records for the west coast of Britain. Other notable reports include *Cyperus longus* and *Juncus maritimus* at Avonmouth, *Lepidium draba* ssp. *chalepense* at the Royal Portbury Dock and *Stratiotes aloides* at Weston-super-Mare. Again this year, species have been found in formerly recorded sites where they have not been seen since near the beginning of this century: the White and Bucknall site for *Corydalis claviculata* near Iron Acton seems to have been refound, *Atriplex portulacoides* has appeared again at Avonmouth and *Sagina nodosa* in a part of Somerset where not reported for very many decades. Several new sites have been found for *Lathyrus nissolia, Rosa micrantha* and *Trifolium micranthum.*

The Spring meeting (3-9 April 1991) of the British Bryological Society was held in North Somerset, an account of this being given by Peter Martin in the *Bulletin of the British Bryological Society*, No. 59 (February 1992), pp. 5-7. More than 200 species of moss and 40 species of liverwort were seen and one new record was made for v.c.6 - *Porella obtusata* on Crook Peak. The liverwort *Tritomaria quinquedentata* (bearing gemmae) was also seen here, and was found on the previous day at Dolebury Warren, this being its third locality for v.c.6. A second record for N. Somerset was the tiny liverwort *Cololejeunea minutissima*, epiphytic on scrub in the dunes at Berrow. Other notable finds included *Bryum caespiticium* var. *imbricatum* at Draycott Sleights, *Rhytidium rugosum* at Ubley Warren, *Orthotrichum pulchellum* at Stockhill plantation and Harridge Wood, *Marchesinia mackaii* in Goblin Combe and *Riccia subbifurca* in the Cheddar Gorge.

Lilian E. Hawker, formerly Professor of Mycology in the Department of Botany of the University of Bristol, died on 5 February 1991 at the age of 82. She came to Bristol in 1945 and held a Personal Chair until her retirement in 1973. Her research in mycology was broadly based but she is most widely known for her work on the physiology of reproduction in fungi and on the taxonomy of fungi that fruit underground, notably the truffles. In this latter study she explored much of the countryside around Bristol, refinding many hypogeous fungi recorded towards the end of the last century by C.E. Broome and C. Bucknall, and adding substantially to the list. She showed that Leigh Woods and Blaise Castle were especially rich in these fungi, much information on their distribution being given in her paper entitled 'Hypogeous fungi of the Bristol district' in these *Proceedings*, 1960 (for 1959), Vol.XXX, Part I, pp. 71-85. She was a supporter of the Bristol Naturalists' Society for very many years, her mycological expertise being much respected.

The sudden and untimely death of Adrian L. Grenfell on 17 November 1991 means a very great loss to all those interested in the botany of the Bristol district and indeed of the whole country. Adrian was widely known for his interest in and knowledge of alien plants, his articles on adventive species contributed to *BSBI*

News and the assistance he frequently gave in the determination of both native and alien plants. His records, notably of rare plants of the Avonmouth Docks and elsewhere in v.c. 34, have enriched 'Bristol Botany' for a long time. He contributed records of a number of alien species new to the area, including *Amaranthus tricolor, A. viridis, Crepis tectorum, Malope trifida, Modiola caroliniana* and *Setaria faberi*. One of his notable finds was of the native *Vicia bithynica*, refound after a lapse of many years at Winterbourne. It is said that he was always hoping to find plants new to Britain; his record of *Quercus castaneifolia* in the Avon Gorge is indeed such a first, and one of the very last records to which he contributed was of *Cotoneaster vilmorinianus*, not previously reported in Britain outside of cultivation. Adrian achieved a great deal, both locally and nationally, as an amateur botanist. He also gave valuable service to the Bristol Naturalists' Society by improving the presentation of the *Proceedings*. The two books of Grenfell Publications, *Supplement to the Flora of Gloucestershire*, 1986, and *The Difficult and Critical Plants of the Lizard District of Cornwall*, 1988, were both very fine productions. An Obituary of Adrian Grenfell is given in these *Proceedings* (pp. XX-XX).

Names of contributors associated with several records, or with the determination of specimens, are abbreviated thus:

RJB	R. J. Bullock	LH	Ms L. Houston
JFB	J. F. Burton	GK	G. Kay
RSC	R. S. Cropper	CK	Mrs C. Kitchen
GC	Miss G. Crouch	MARK	M. A. R. Kitchen
JF	Mrs J. Fryer	MHM	Dr M. H. Martin
IFG	Miss I. F. Gravestock	RMM	Miss R. M. Martin
DEG	D. E. Green	RM	R. Milne
IPG	I. P. Green	PJMN	P. J. M. Nethercott
PRG	P. R. Green	TCGR	Dr T. C. G. Rich
ALG	A. L. Grenfell	FR	Dr F. Rose

The area covered by this report is essentially that defined by J. W. White for his *Flora of Bristol* (1912). The eastern boundary is taken as the old boundary of Wiltshire where it meets the old boundaries of both Gloucestershire and Somerset. The southern limit is taken as approximately the course of the River Brue along some of its length. The area comprises the northern part of the Watsonian vice-county of North Somerset (v.c.6) and the southern part of West Gloucestershire (v.c.34). In the following records these parts are designated S and G respectively.

Many plant names are in accordance with C. Stace's *New Flora of the British Isles*, 1991.

Gymnocarpium robertianum (Hoffm.) Newman In good quantity, Goblin Combe, near Cleeve, S, MARK & CK. Not seen in Burrington Combe.

Ranunculus lingua L. In flooded quarry, Downhead, S, DEG.

R. hederaceus L. By ponds near railway, Brent Knoll, S, PRG & IPG. Also Swainswick, S, DEG.

R. penicillatus (Dumort.) Bab. In the River Frome at Hambrook, G, PJMN.

Berberis vulgaris L. One large bush, Worlebury Hill, S, PJMN.

Ceratophyllum demersum L. Ham Green, S, RSC.

Corydalis claviculata (L.) DC. (*Ceratocapnos claviculata* (L.) Liden) A small patch flowering on rocky outcrop by scrubby thicket, near Iron Acton, G, MARK, CK, P. Smith & ALG. This appears to be the site discovered in 1908 by White and Bucknall (J. W. White, *Flora of Bristol*, 1912, p. 138). It is several hundred yards from the locality for this *Corydalis* found by I. W. Evans (*Bristol Botany in 1942*, p. 363; *Bristol Botany in 1990*, p. xxxiii).

Fumaria capreolata L. Several patches on dumped earth, Compton Bishop, S, RSC.

Diplotaxis tenuifolia (L.) DC. One large plant, waste ground, Highbridge, S, RSC.

Lepidium campestre (L.) R. Br. A large patch in field gateway, Sandford Hill; two plants by track, Shapwick Heath; several plants in scrub, Hellenge Hill, Bleadon; several at edge of meadow, Oldmixon; all S, RSC.

L. latifolium L. By towpath, near Arno's Vale, Bristol, S, RM.

Viola canina L. Crook Peak, S, GC.

Hypericum montanum L. In a survey of this species in the Avon Gorge, nearly one thousand plants were counted on the Bristol City side, scattered from St Vincent's Rocks to the Great Quarry, G, LH. There were many fewer on the Somerset side of the Gorge, mainly restricted to the quarries of Leigh Woods, S, LH.

H. elodes L. Persistent, with *Hydrocotyle vulgaris* L., in boggy flush, Rodway Hill, G, MARK & CK.

Cerastium pumilum Curt. Good quantity in rough, rocky grassland, Hellenge Hill, Bleadon; plentiful, Sandford Hill; abundant on rock outcrops, Draycott; all S, RSC.

C. semidecandrum L. Cross Plain, S, and Sandford Hill, S, RSC.

Stellaria pallida (Dumort.) Piré Golf course, Bathampton Down, S, MARK, CK & R.D. Randall.

Sagina nodosa (L.) Fenzl Holwell quarry, S, PRG; not recorded in this part of Somerset since 1917.

Atriplex longipes Drejer In small quantity, upper salt marsh, Avonmouth Docks, G, MARK & CK. Also in narrow salt marsh below the Powder House, Shirehampton, Bristol, G, MARK.

Atriplex portulacoides L. (*Halimione portulacoides* (L.) Aellen) Two small patches at edge of salt marsh, Avonmouth, G, where recorded as gone by 1896 (J. W. White, *Flora of Bristol*, 1912, p. 513). Also persistent at Shirehampton, G (see *Bristol Botany in 1988*, p.xxiv). Extending for about 50 metres on west-facing cliffs of Dolomitic Conglomerate at the side of Chapel Pill, S; this is the first report for the south side of the River Avon. All records MARK & CK.

Salicornia europaea L. Lower salt marsh, Avonmouth Docks, G, MARK & CK, det. FR.

S. obscura P. Ball & Tutin In two places, on fairly bare sides of muddy channels of lower salt marsh adjoining the Severn, with *S. europaea* L. and *S. ramosissima* J. Woods, Avonmouth Docks, near Holes Mouth, G. On fairly bare mud, with *S. ramosissima* J. Woods, lower salt marsh on banks of the Avon, Royal Portbury

Dock, and in a similar habitat on the banks of the Severn, St George's Warth, Royal Portbury Dock, S. All specimens collected and det. MARK & CK, conf. FR. These records represent the first for the west coast of Britain, the first for v.c. 34 and the first and second for v.c.6.

S. fragilis P. Ball & Tutin In open areas of lower salt marsh on banks of the Avon, Royal Portbury Dock, and also on pebbly sandy part of lower salt marsh on banks of the Severn, St George's Warth, Royal Portbury Dock, S, MARK & CK, det. FR.

Tilia platyphyllos Scop. With *Sorbus torminalis* (L.) Crantz, one sapling on steep sandstone cliffs overhanging the River Avon, Shirehampton, G, MARK.

T. cordata Mill. Rare but native in woodland flanking the River Frome, Frenchay, G, PJMN.

Geranium pusillum L. A small patch at edge of golf course, dunes, Berrow, S, RSC.

G. purpureum Vill. ssp. *purpureum* A few plants on cliff ledges, Great Quarry, Avon Gorge, Bristol, G, LH.

Erodium maritimum (L.) L'Hérit. Plentiful on rock outcrop, Cross Plain, S, RSC; also on rabbit warren, Wavering Down, S, RSC. On an anthill, Dolebury Warren, S, MARK, CK & C.D. Preston.

Trifolium striatum L. In thin turf on rocky slopes, Rookham, S, RSC. Also *Koeleria macrantha* (Ledeb.) Schultes.

T. scabrum L. Flowering well in turf on south slope, Lodge Hill, Westbury-sub-Mendip, S, RSC.

T. micranthum Viv. A small patch in grassland, near Beck's Pool, Frenchay, G, PJMN. With abundant *T. striatum* L., on sandstone outcrops in pasture, Algars Manor, Iron Acton, G, MARK, CK & ALG. A few plants in rocky field, Cleeve, S, RSC. East Brent, S, PRG. Catcott, S, PRG & IPG.

Lotus tenuis Waldst. & Kit. ex Willd. (*L. glaber* Miller) One plant on seabank, Chapelhouse, Sheperdine; also one further north at Hill Flats, G, MARK & CK.

Lathyrus nissolia L. A good colony in field near the River Frome, Frenchay, G, PJMN. In 1990, East Brent, S, IPG. In good quantity along green lane, West Huntspill, S, RSC. Very plentiful on raised bank, Portbury Wharf, S, RSC.

L. palustris L. Plentiful in field north of the well-known Marsh Pea locality, Catcott, S, IPG. It was formerly more widespread in this area.

Potentilla tabernaemontani Aschers. (*P. neumanniana* Reichb.) A small patch, rocky ground, Sandford Hill, S, RSC.

P. anglica Laichard. One plant in peat cutting, Street Heath, S, RSC.

Aphanes inexspectata Lippert (*A. microcarpa* auct. non (Boiss. & Reut.) Rothm.) Old airfield runway, Charmy Down, St Catherine, S, DEG.

Sanguisorba officinalis L. Several small patches alongside rhyne, near Conygre Farm, north of Earthcott, G, MARK & CK. Also *Serratula tinctoria* L.

Rosa obtusifolia Desv. A few bushes in two hedgerows, Bower Hill, Wookey; also Hay Hill, Wells, and Sandford Hill; all S, RSC.

R. tomentosa Sm. Above the River Frome at Cleevewood, G, PJMN, where reported by J. W. White, *Flora of Bristol*, 1912, p. 292. One shrub in hedge, Valley Road, Weston-in-Gordano, S, PJMN. One bush, with *R. arvensis* Hudson, *R. canina* L. and *R. stylosa* Desv., Bower Hill, Wookey, S, RSC.

R. micrantha Borrer ex Sm. With *R. stylosa* Desv., below the Portway at Sneyd Park, Bristol, G, PJMN. One shrub near an entrance to Leigh Woods, Bristol, S, PJMN, no doubt in a site known to J. W. White, *Flora of Bristol*, 1912, p. 293. The most plentiful rose on Lodge Hill, Westbury-sub-Mendip, with much *R. stylosa* Desv.; scattered over slope, Ben Knowle Hill, Wookey, with *R. stylosa* Desv., *R. canina* L. and hybrids; a few bushes on Nyland Hill, near Draycott; about thirty bushes in scrub, Hellenge Hill, Bleadon; a dozen bushes at edge of quarry, Sandford Hill; one bush, old quarry, Ham Green; all S, RSC.

Sorbus × *vagensis* Wilmott In the considerable damage caused by the storm of 25 January 1990, two large trees growing together were lost in Weston Big Wood, near Portishead, S, PJMN. A tree elsewhere in the wood was also lost, but growth of suckers should ensure survival.

S. eminens E. F. Warb. This Whitebeam was found in 1990 by Dr M.C.F. Proctor at the eastern end of Worlebury Hill (used in the sense of the whole Carboniferous limestone west–east ridge from above the shore-line inland to the alluvial plain), S. Fuller study in 1991 shows it to be scattered at the eastern end in woodland, scrub and on the golf course for over a mile. The leaves are rather variable, unlike *S. eminens* in the Avon Gorge, the main shoots are thicker and there are other small differences. Only one shrub of *S. eminens* has been found in the wooded west, where in contrast *S. porrigentiformis* E.F. Warb., absent on the eastern part, is present but rare (recorded by Dr E.F. Warburg above Weston-super-Mare and on the side above Kewstoke, see *Bristol Botany in 1955*, p. 102). *S. aria* (L.) Crantz s.s. occurs, but very sparingly, in the western woodland, where it is probably planted or bird-sown. *S. eminens* is present in old quarried area, Weston Big Wood, near Portishead, S, where *S. aria* (L.) Crantz s.l. is plentiful and very variable in the woodland. All records PJMN.

S. torminalis (L.) Crantz Chill Wood, Iron Acton, G, PJMN. J. W. White, *Flora of Bristol,* 1912, p. 309, records very large trees 'by far the finest in the district' here, but only two large trees remain, one of which is badly damaged; there are very few saplings, but many suckers near one of the large trees, PJMN.

Umbilicus rupestris (Salisb.) Dandy Old quarry, Chill Wood, Iron Acton, G, PJMN.

Epilobium tetragonum L. ssp. *lamyi* (F. Schultz) Nyman Waste ground, with *Odontites vernus* (Bellardi) Dumort., Stoke Bishop, Bristol, G, IFG.

E. roseum Schreb. Adjoining motorway, Shirehampton, Bristol, G, IFG. Nearby was *Medicago sativa* L.

E. ciliatum Raf. × *E. parviflorum* Schreb. Pilton, S, Dr A.C. Leslie.

Myriophyllum verticillatum L. Meare, S, PRG.

Trinia glauca (L.) Dumort. Thousands of plants flowering in the extensive areas of stony rock outcrop, but far fewer plants in the adjoining grassland, Compton Hill, Compton Bishop, S, PJMN. The large increase on previous years may result from the warm weather of 1989 and 1990.

Sison amomum L. In the Frome Valley close to the river, near Hambrook, G, PJMN.

Oenanthe pimpinelloides L. Very plentiful in grassy area adjoining railway north-east of Montpelier, Bristol, G, RM. Also near the railway line were *Onobrychis viciifolia* Scop., *Symphytum tuberosum* L., *Borago officinalis* L., *Salvia verticillata* L., *Campanula poscharskyana* Degen, *Lonicera japonica* Thunb. ex Murray, *Cephalaria gigantea* (Ledeb.) Bobrov and *Tragopogon porrifolius* L.

Euphorbia platyphyllos L. On bank and also, with *Anthemis cotula* L., in scrubby field, Beech Hill, near Ditteridge, G, MARK & S.H. Bishop.

E. exigua L. On fairly bare ground, with *Kickxia elatine* (L.) Dumort., margin of hay meadow, Oldmixon, S, RSC.

Rumex pulcher L. Lodge Hill, Westbury-sub-Mendip, S, and one plant on Hellenge Hill, Bleadon, S, RSC.

Populus nigra L. A male tree on roadside, Rooksbridge, S, RSC.

Salix × *forbyana* Smith (*S. purpurea* L. × *S. viminalis* L. × *S. cinerea* L.) Wedmore, S, PRG, conf. R. D. Meikle. A second record for this complex hybrid.

Calluna vulgaris (L.) Hull In small quantity, woodland track, Michael Wood, G, MARK & CK.

Limonium vulgare Miller A patch of *c.* 1 m square in salt marsh, Avonmouth Docks, G, MARK & CK. This Sea Lavender has only a tenuous hold in v.c.34.

Armeria maritima (Miller) Willd. ssp. *maritima* Abundant on salt marsh, New Pill Gout, Chittening Warth, G, MARK & CK. A flowering patch in salt marsh, Portbury, S, MARK & CK. Not lost by the building of Portbury Dock as thought probable (R. G. B. Roe, *Flora of Somerset,* 1981, p. 159).

Primula veris L. × *P. vulgaris* Huds. One plant by rhyne, near Conygre Farm, north of Earthcott Green, G, MARK & CK.

Centaurium pulchellum (Sw.) Druce A few plants in rough grass in field, Barrow Hill, Great Elm, S, RSC.

Nymphoides peltata Kuntze Pond, by bridge over railway, north of Highbridge, Burnham Without, S, PRG, IPG & GC.

Echium vulgare L. Old mining ground, Pensford, S, RSC.

Hyoscyamus niger L. One plant near rabbit warren, Brean Down, S, RSC.

Verbascum lychnitis L. Persistent on grassy bank, Beckington, S, A. Duff & RSC, where noted by J. W. White, *Flora of Bristol,* 1912, p. 449.

V. virgatum Stokes Two plants in scrubby grassland, Fry's Hill, Axbridge, S, RSC.

Orobanche rapum-genistae Thuill. Persistent on Broom, Kilmersdon, S, RSC.

O. hederae Duby Stoke Bishop, Bristol, G, IFG. Field, foot of Loxton Hill, S, RSC. Wedmore, S, IPG.

O. loricata Reichenb. This Broomrape identified by D. J. Hambler from Brean Down (R. G. B. Roe, *Flora of Somerset,* 1981, p.186) is now thought to be atypical *O. hederae* Duby (F. J. Rumsey and Dr S. L. Jury).

Acinos arvensis (Lam.) Dandy (*Clinopodium acinos* (L.) Kuntze) Frequent on rocky slope, Loxton Hill; in small number, Shute Shelve Hill; many in vicinity of old quarry near Compton Martin; disused quarry, Queen Charlton; several plants near old quarry, Great Elm; all S, RSC.

Campanula glomerata L. Several plants on grassy slopes of valley, Foxcote, S, RSC. Also *C. rotundifolia* L. and *C. trachelium* L.

Valerianella carinata Lois. Stoke Bishop, Bristol, G, IFG.

Senecio squalidus L. × *S. vulgaris* L. (*S.* × *baxteri* Druce) With both parents in close proximity, roadside, Avonmouth, G, RM. On waste ground nearby was *Sisymbrium altissimum* L.

Filago vulgaris Lam. (*F. germanica* L. non Hudson) Plentiful on floor of quarry, Milton Hill, Wookey Hole, S; also several plants on rocky slope, Shute Shelve Hill, S, RSC.

F. minima (Sm.) Pers. Old quarry, Downhead, S, PRG.

Anthemis arvensis L. Sown on car park lots where also *Agrostemma githago* L. and *Calendula arvensis* L., Bristol Castle, G, MARK & CK.

Achillea ptarmica L. In small amount in rough grassland by stream, Tapwell Bridge, Cromhall, G, MARK & CK. Now uncommon in Avon because of land drainage.

Stratiotes aloides L. A colony in rhyne at Locking Bridge, Weston-super-Mare, S, MHM, RMM & RJB. Also in the rhyne were *Hydrocharis morsus-ranae* L. and *Sparganium erectum* L. and in an associated pond *Ceratophyllum submersum* L. and *Butomus umbellatus* L. Work to control flood water will destroy this site but the Water Soldier is to be relocated nearby.

Potamogeton perfoliatus L. River Brue, Meare, S, PRG.

Ruppia maritima L. Persistent in a small part of a brackish rhyne, Portbury, west of Pill, S, GK. The site was partly destroyed by pipe-laying in the summer of 1991.

Zannichellia palustris L. West Huntspill, S, RSC.

Juncus foliosus Desf. In boggy flush, Rodway Hill, G, MARK & CK.

J. maritimus Lam. Fruiting well in single patch of about one metre square, Avonmouth Docks, G, MARK & CK. This is the first record of the Sea Rush for v.c.34 east of the Severn since 1869 when it was present at New Passage (J. W. White, *Flora of Bristol,* 1912, p. 597).

Allium vineale L. Plants lacking spathes and with double-headed seeding scapes, presumed sports of this species, waste ground, Shirehampton and Lawrence Weston marshes, Bristol, G, IFG.

A. oleraceum L. Over five thousand plants at margin of Clifton Down, above the Gully and in the vicinity of the Great Quarry, Avon Gorge, Bristol, G, LH. Over two hundred plants on roadside verge above Leigh Woods, Bristol, S, LH.

A. schoenoprasum L. Highbridge, S, IPG.

Epipactis purpurata Smith A colony in hazel coppice, Littley Wood, near Wickwar, G, RSC, one specimen being entirely grey-purple. See Penistan, M. J.

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E. leptochila (Godfery) Godfery In deep shade, Clarken Combe, Ashton Court Park, Bristol, S, RSC.

E. phyllanthes G.E. Smith Persistent by towpath, Leigh Woods, Bristol, S, RSC.

Spiranthes spiralis (L.) Chevall. Frequent in disturbed area above salt marsh, Sheephouse Farm, Portbury, S, MARK, CK & GK.

Ophrys apifera Hudson One flowering in fairly tall (unmown) vegetation by a Hawthorn bush, Clifton Down, Bristol, G, JFB; the Bee Orchid, although extremely scarce, has been known in the grassland of the Downs for a few years. On south slope, Lodge Hill, Westbury-sub-Mendip, S, and on Ben Knowle Hill, Wookey, S, RSC.

O. apifera Hudson var. *chlorantha* Godfery Black Rocks, Avon Gorge, Bristol, G, RM.

Himantoglossum hircinum (L.) Spreng. In rough grass on golf course, Berrow, S, IPG, where associated with e.g. *Carex arenaria* L., *Cynoglossum officinale* L., *Erodium cicutarium* L. (L'Hérit.), *Festuca rubra* L., *Galium verum* L. and *Sedum acre* L., RSC. Although the Lizard Orchid was known in the grounds of a derelict bulding at Burnham until 1951 (see also *Bristol Botany in 1924*, pp. 176-177), its presence on the dune system at Berrow has not been previously recorded. The last report of this species in Somerset was in 1978 (*Bristol Botany in 1978*, p. 40).

Orchis morio L. Plentiful in grassland, with colour variants from purple and white, pale pink and pure white, Draycott; fen meadow, Shapwick Heath; a single flowering plant, Cheddar Gorge; all S, RSC.

Dactylorhiza incarnata (L.) Soó Bathford, S, DEG.

Anacamptis pyramidalis (L.) L. C. M. Richard One flowering plant in unmown rough grassy area bordered by open woodland, Clifton Down, Bristol, G, K. B. Taylor & G. Milward. In the Sandwiths' annotated copy of J. W. White's *Flora of Bristol,* 1912, p. 558, is a record of one plant in 1916 on Durdham Down. The persistence of the Pyramidal Orchid on the Bristol Downs, although precarious, is of considerable note. Plentiful in grassland, south slopes of Ben Knowle Hill, Wookey, S, RSC.

Eriophorum angustifolium Honck. A good patch at edge of rhyne, Weston Moor, Gordano, S, RSC.

Eleogiton fluitans (L.) Link (*Scirpus fluitans* L.) Still flourishing, Weston Moor, Gordano, S, RSC; also in rhyne, Canada Farm, Shapwick Heath, S, RSC.

Blysmus compressus (L.) Panz. ex Link Persisting but in poor condition, Windsor Hill Marsh SSSI, Shepton Mallet, S, IFG. *Eleocharis uniglumis* (Link) Schult. also still present but in much reduced quantity.

Cyperus longus L. A large flowering clump in water draining from a building on waste ground polluted by heavy metals, Avonmouth, G, MHM & RJB.

Carex distans L. Several plants, Tealham Moor, Somerset Levels, S, RSC.

C. demissa Hornem. (*C. viridula* Michaux ssp. *oedocarpa* (Andersson) B. Schmid) Abundant, with *C. ovalis* Gooden., Engine Common, G, MARK & CK.

C. extensa Gooden. Locally abundant, upper salt marsh, Avonmouth Docks, G, MARK & CK. A single tuft was reported by C.G. Trapnell between Avonmouth and New Passage (H.J. Riddelsdell *et al.*, *Flora of Gloucestershire,* 1948, p. 515).

C. strigosa Hudson Many fruiting plants along wooded stream, Fry's Bottom, Chelwood, S, RSC. Also *Luzula pilosa* (L.) Willd.

C. muricata L. ssp. *lamprocarpa* Čelak. Mark, S, PRG & IPG.

Danthonia decumbens (L.) DC. (*Sieglingia decumbens* (L.) Bernh.) Ridge and furrow pasture by the River Severn Flats, Rockhampton, G, MARK & CK.

Vulpia myuros (L.) C. C. Gmel. In some quantity, Royate Hill and St Philip's Marsh, Bristol, G, and Avonmouth, G, MHM & RJB. A few plants in back-yard, Highbridge, S, RSC.

Poa bulbosa L. In fair quantity, golf course, Berrow, S, PRG & IPG, conf. Dr J.R. Edmondson. This is the first record of this coastal grass in v.c.6.

P. compressa L. Very plentiful, St Philip's Marsh, Bristol, G, MHM & RJB. Also *Phalaris canariensis* L.

P. subcaerulea Smith (*P. humilis* Ehrh. ex Hoffm.) Flourishing on banks of channel, Uphill, S, RSC.

Bromus benekenii (Lange) Trimen (*Bromopsis benekenii* (Lange) Holub) A small clump on uncut shaded verge, with *Arrhenatherum elatius* (L.) P. Beauv. ex J. S. & C. Presl, Dyrham Park, G, S. Hedley, det. C. Fraile. This is the first confirmed record of this overlooked grass for v.c.34.

Calamagrostis epigejos (L.) Roth A fine colony at edge of quarry, Sandford Hill, S, RSC.

Gastridium ventricosum (Gouan) Schinz & Thell. A good patch, Nyland Hill, near Draycott, S, RSC.

Alopecurus bulbosus Gouan Abundant on salt marsh from Littleton Pill southwards to Rushen Gout, G, MARK & CK.

ALIENS

Azolla filiculoides Lam. A few plants on village pond, Newton, near Thornbury, G, MARK & CK.

Nigella damascena L. Well-established in several sites in Bristol, including waste ground by Plimsoll Bridge and in grass by railway near Montpelier, G, RM.

Lepidium draba L. ssp. *chalepense* (L.) Thell. (*Cardaria chalepensis* (L.) Hand.-Mazz.) One large plant, which set good fruit, Royal Portbury Dock, S, MARK & CK, conf. TCGR. This is a first record for v.c.6.

Bunias orientalis L. In several sites in vicinity of Shirehampton and also below Black Rocks, Avon Gorge, Bristol, G, RM.

Barbarea verna (Miller) Aschers. Highbridge, S, IPG & GC.

Arabis alpina L. Wall, Millard's Hill, S, Mrs G. Read, det. TCGR. This garden escape was previously recorded as *A. caucasica* Willd. ex Schldl.

Descurainia sophia (L.) Webb ex Prantl One well-grown fruiting plant in dune area recently cleared of scrub, Berrow, S, RSC.

Amaranthus retroflexus L. East Brent, S, IPG.

A. albus L. Burnham-on-Sea, S, IPG.

Tilia × *europaea* auct. non L. Several seedlings in lawn, arising from a fertile tree in boundary hedge, Sneyd Park, Bristol, G, PJMN.

Melilotus officinalis (L.) Lam. One plant, disused quarry, Queen Charlton, S, RSC.

Vicia villosa Roth Several plants on earth mound, Lawrence Weston, G, RM. Also *Alchemilla mollis* (Buser) Rothm., *Lonicera japonica* Thunb. ex Murray, *Campanula portenschlagiana* Schultes and *Centaurea montana* L.

Sanguisorba minor Scop. ssp. *muricata* (Gremli) Briq. (*Poterium polygamum* Waldst. & Kit.) Brent Knoll, S, PRG & IPG.

Cotoneaster lacteus W. Smith A single shrub above banks of the River Avon, Shirehampton, Bristol, G, MARK, det. JF.

C. bullatus Bois One bush, Royal Portbury Dock, S, MARK, conf. JF.

C. sternianus (Turrill) Boom One bush, Royal Portbury Dock, S, MARK, conf. JF.

C. vilmorinianus Klotz At least one well-grown shrub by railway line, Montpelier, Bristol, G, MARK, CK, ALG & M. Trotman, det. JF. This shrub has never been previously recorded in Britain as an escape.

Mespilus germanica L. Several trees, well fruiting, at top of coastal cliffs, High Cliff, Clevedon, S, MARK & CK. The Medlar was last recorded at Clevedon in 1938 (R. G. B. Roe, *Flora of Somerset,* 1981, p. 110).

Sorbus intermedia (Ehrh.) Pers. Fruiting on waste ground, Shirehampton, Bristol, G, IFG, det. PJMN.

Pyrus communis L. var. *sativa* Lam. et DC. Sneyd Park, Bristol, G, PJMN. A small tree by the Avon under Cook's Folly was recorded by Mrs C.I. Sandwith (*Bristol Botany in 1951*, p. 244); in 1991 probably the same tree, now well grown, bore an abundant crop of pears.

Crassula helmsii (Kirk) Cockayne Pond, Clevedon, S, DEG.

Bergenia crassifolia (L.) Fritsch Several plants on ivy-covered cliffs, near Suspension Bridge, Avon Gorge, Bristol, G, RM.

Oenothera cambrica Rostanski In fair quantity with plentiful *O. erythrosepala* Borbás (*O. glazioviana* Micheli ex C. Martius) and *O. stricta* Ledeb. ex Link, dunes, Berrow, S, RSC.

Mimulus guttatus DC. A few plants in pool by roadside, near Pool Farm, Engine Common, G, MARK & CK.

Lathraea clandestina L. By stream, Blaise Castle, Bristol, G, RM.

Leycesteria formosa Wallich One fine plant on wooded slope, by Suspension Bridge, Leigh Woods, Bristol, S, RM.

Cicerbita macrophylla (Willd.) Wallr. Stoke Bishop, G, IFG. Also *Phalaris canariensis* L.

Lagarosiphon major (Ridley) Moss East Brent, S, DEG. This is the first record in v.c.6 since 1959.

Acorus calamus L. Persistent in Beck's Pool, Frenchay, G, PJMN, where noted by J. W. White, *Flora of Bristol,* 1912, p. 604.

Arum italicum Mill. ssp. *italicum* A well-established colony in small wood at road junction, Leighwoods, S, RM. Also *Acanthus mollis* L.

Lemna minuta Kunth (*L. minuscula* Herter) River Frome, Tellisford and Rode, S, PRG.

Cortaderia selloana (Schultes & Schultes f.) Asch. & Graebner Well naturalised on rubble dumped at edge of salt marsh, Royal Portbury Dock, S, MARK & CK.

Anisantha madritensis (L.) Nevski (*Bromus madritensis* L.) Highbridge, S, PRG.

A. diandra (Roth) Tutin ex Tzvelev (*Bromus diandrus* Roth) Widespread on dunes on margins of thickets of Sea Buckthorn, Berrow, S, PRG & IPG. This long-awned grass was reported by N. Y. Sandwith in 1961 as present in quantity over a very small area of the Berrow dunes (*Bristol Botany in 1961,* p.244), but by Capt. R. G. B. Roe in *The Flora of Somerset,* 1981, as not persisting here. It appears now to be strongly re-established on the dunes. Also on heaps of rubbish at Dunball on the bank of the River Parrett, S, IPG.

Hordeum jubatum L. On disturbed area of salt marsh by sea wall, Portbury Wharf, S, MHM & RMM, where new pipeline installed.

Phalaris paradoxa L. Arable field, Tellisford, S, IPG.

Setaria verticillata (L.) P. Beauv. Burnham-on-Sea, S, PRG & IPG.

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AN INTRODUCTION TO STREET TREES IN BRISTOL

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INTRODUCTION

This paper is based mainly on the findings of a survey undertaken by the authors during 1990 and 1991. Our aim was to stimulate a wider interest in street trees and in their role as natural habitats, and to illustrate the wealth of Bristol's street tree flora. Following ALG's sad death (see Titchen, 1992; Willis, 1992) ACT continued the work into 1992. As the title implies, this account is by no means exhaustive and more work is planned.

The survey to date has concentrated on areas round the city centre, on the main roads which lead north and east from it, and on some residential areas: Shirehampton, Westbury-on-Trym, Clifton, Redland, Henleaze, Cotham, Fishponds, Downend and Lockleaze. We did not set out to deal with every tree in these areas - that would have been impracticable - but to obtain an idea of the range of forms to be found on our streets, and to give locations of the more interesting specimens.

Most of our work was done by car; one of us identified street trees while the other drove slowly down the major thoroughfares. This method became difficult in the side roads of Westbury-on-Trym, Horfield, Fishponds and Downend, and in the centre of Bristol, where the areas had to be patrolled on foot. Our journeys were made at various times of the year and return visits helped to confirm identifications (particularly amongst the Rosaceae, where the fruits were needed). One key fact soon became apparent - that large areas of Bristol are sadly devoid of street trees altogether.

The hot summers of recent years and consequent droughts have caused some street trees to die, particularly where the water catchment area around the trunk was inadequate.

Doubtless there are street trees we have missed. Some may be as distinctive as *Eucalyptus*, others may be different varieties of more common species. Driving around looking at street trees can be fun, but is safest on Sundays when traffic is lightest, and the central areas are best covered on foot. Please take care!

WHAT IS A STREET TREE?

Many trees occur in parks and gardens as well as those on our streets, roadsides and verges. The criteria we used to define a 'street tree' are as follows:

(i) The tree must not be growing on private property.

(ii) The trunk must be within 6 m (20 ft) of a road, walkway or parking area which is maintained by a local authority.

(iii) Traffic islands of all sizes and pedestrian precincts have been included since they are obviously part of the street scene (the paved areas of St

Augustine's Parade and Colston Avenue - here usually referred to jointly as 'the Centre' - and Broadmead are included in this category).

(iv) Parkland trees on the Blaise Castle, Ashton Court and Oldbury Court estates and other similar areas were excluded, as were all trees on Clifton and Durdham Downs except those that satisfied criterion (ii).

IDENTIFICATION OF THE TREES

The identification of street trees is complicated by the existence of many hybrids, both natural and man-made, and of even more selected forms or 'cultivars'. For this reason only the most striking and well-known taxa are mentioned at varietal level, and a relatively broad taxonomic viewpoint has been adopted. In many cases authorities disagree about parentage, origin or nomenclature; for convenience, the names used are those given by *Hillier's Manual* (1991) - which may be consulted for synonyms etc. - supplemented in a few cases by Mitchell (1974). All names of cultivars are given in roman type, in single quotation marks. Some varieties we encountered may have been questionably named; this is especially so in the family Rosaceae, which includes the well-known but difficult genera *Sorbus* (whitebeams and rowans), *Malus* (apples) and *Prunus* (cherries).

The most common street trees are: London Plane, 30%; Common or English Lime, 30%; and Norway Maple, 20%. The balance comprises many species, with Horse Chestnut and various cherries accounting for approximately 10%. Below, the main groups are dealt with in turn; scientific names are given under the main entry for each form. All the street trees encountered are listed in the Appendix, which is arranged alphabetically by taxon for ease of use.

CONIFERS (Gymnospermae)

The Ginkgo (*Ginkgo biloba*) is one of two 'living fossil' conifers flourishing on Bristol's streets. A common street tree on the continent, it has recently been planted in Carnarvon Road, Redland, intermixed with cherries and Box Elder, and is also to be found in streets nearby. Hopefully these are male trees: mature female Ginkgos produce many marble-sized 'silver apricots', which exude an unpleasant putrefying smell as they rot - hence the male is to be preferred as a street tree. (Such 'fruits' are produced by many primitive gymnosperms, whether or not the ovule has been fertilised.) The male Ginkgo is common in Bristol parks and gardens; the female is rare but can be seen at Ashton Court (behind the house) and at Blaise Castle (near the Dairy). The trees are easy to identify: the leaf shape is similar to that of our Maidenhair Fern (*Adiantum capillis-veneris*) and it is known as the Maidenhair Tree. The whorls of fan-shaped leaves turn yellow in autumn before they are shed, and the simple spiky branches with spurs on the sides make recognition easy even in winter.

The other 'living fossil' is the **Dawn Redwood** (*Metasequoia glyptostroboides*), which was discovered growing wild in its native China in 1941 and introduced to Britain in 1948. Three specimens thrive on the roundabout at the junction of Prince Street and Redcliffe Way, along with many other interesting species. The Dawn Redwood, somewhat like a very lax Yew, is close in appearance to the Swamp Cypress (*Taxodium distichum*), but the Dawn Redwood's soft green leaves appear

PLATE 1. A, Giant Redwood (Wellingtonia; *Sequoiadendron giganteum*), planted in 1883, Shirehampton. B, Blue Cedar (*Cedrus atlantica glauca*), The Centre. Both summer 1992.

much earlier, and are arranged in pairs oppositely and not alternately. Both species are deciduous. Cones have not yet been found on these three trees but they occur on more mature trees elsewhere in the city.

The **Yew** (*Taxus baccata*) is very scarce along Bristol streets. Half a dozen in Bromley Heath Road, Downend are probably relics of an earlier residential development. The best examples are to be found on traffic islands, e.g. the aforementioned Prince Street roundabout. Eight superb berry-bearing Golden Irish Yews (*T. b.* 'fastigiata aurea') grace the Centre; this is a columnar cultivar of Yew, and is extremely slow-growing.

We found a superb example of the **Giant Redwood** - (Wellingtonia; *Sequoiadendron giganteum*) in the centre of the road in Shirehampton (Plate 1A), obviously planted on the Green. A damaged inscription shows that it was planted in 1883 to commemorate some event. Already this must be Bristol's tallest tree - how tall will it be in another 100 years?. Such Redwoods were introduced as seed from North America in 1853 and were widely planted in the south-west of England, distributed from Veitch's famous nursery in Exeter. Judging by the number to be seen today it must have been a very successful commercial product!

Japanese Red Cedar (*Cryptomeria japonica*) is thriving on the central islands in the Centre. Otherwise similar in appearance to the Wellingtonia, it has longer and brighter glossy green leaves, which lack the characteristic smell of aniseed released by the crushed foliage of the Wellingtonia.

Monkey Puzzle Tree (*Araucaria araucana*) At one time the Promenade, Clifton had a superb example, planted in Victorian times. Sadly this was felled, and we know of no other street example. One would make a fine centrepiece for a large traffic island.

Pines characterize Bristol's traffic islands, including the Centre where three species occur by Neptune's Statue: **Weymouth Pine** (*Pinus strobus*; five needles), **Monterey Pine** (*P. radiata*; three needles) and **Austrian-Crimean Pine** (*P. nigra*; two needles). Fine examples of other pines grow on the large, well laid-out roundabout opposite St Mary Redcliffe Church; e.g. the long-leaved **Jeffrey's Pine** (*P. jeffreyi*; three needles, stiff leaves). No cones have been found on these trees yet, but away from the streets cone-bearing specimens can be seen on the Oldbury Court Estate. The St Mary Redcliffe roundabout also holds four young **Bhutan Pines** (*P. wallichiana*; five needles) which show the typical long bluish-grey needles, each with a kink about 1 cm from the base. In time these trees will produce banana-shaped cones, very resinous, up to 30 cm long and always in bunches - seen clearly in St George's Churchyard (Great George Street/Charlotte Street, off Park Street).

P. nigra occurs too on the Prince Street roundabout, where the unusual **Bristle. Cone Pine** from the Rocky Mountains (*P. aristata*; five needles) can also be seen; its crushed foliage smells of turpentine. Known as 'the oldest tree in the world', specimens living at high altitude can be 5,000 years old.

Cedars are to be found in the form of the **Atlas** or **Algerian Cedar** (*Cedrus atlantica*). The **Blue Cedar** (*C. a. glauca*), with its bright blue-grey leaves, occurs in the Centre, where specimens with normal leader branches are developing well and will in time make excellent trees (Plate 1B). However, some examples have lost their leader and consequently have become vase-shaped. A gigantic **Cedar of Lebanon** (*C. libani*) occurs at the top of Westmoreland Road, Redland; it is certainly a relic from an earlier estate. Two other species, the **Deodar Cedar** (*C. deodara*) and the **Cyprus Cedar** (*C. brevifolia*) have been noted as dwarf forms in the large concrete containers placed outside the Victoria Rooms in Clifton annually by Bristol City Council. Three young Deodar Cedars grow on the St Mary Redcliffe roundabout, and the traffic island in Bedminster Parade has several 'poorly' specimens which do not appear to have a long life ahead.

Cypresses (*Cupressus* spp.) and **False Cypresses** (*Chamaecyparis* spp.) are also poorly represented in the street, although very common in parks and gardens. The **Lawson Cypress** occurs as its yellow cultivar (*Chamaecyparis lawsoniana* 'lutea') in the Centre and as three magnificent specimens on Prince Street roundabout. Other specimens noted were: **Sawara Cypress** (*Ch. pisifera* 'plumosa') on Prince Street roundabout; *Cu. macrocarpa* ?'Goldcrest' on St Mary Redcliffe roundabout; and young × *Cupressocyparis leylandii* hybrids on the roundabout opposite Temple Meads Station.

Junipers occur on Prince Street roundabout as a variegated form of the **Chinese Juniper** (*Juniperus chinensis*) and the pencil-slim, blue-foliaged cultivar 'stricta' of our **Common Juniper** (*J. communis*), while St Mary Redcliffe and Bedminster Parade roundabouts both have large quantities of a prostrate form of juniper.

During our investigation of the Temple Meads traffic island we were amazed to find a young 2 m high specimen of the **Incense Cedar** (*Calocedrus* - formerly *Libocedrus* - *decurrens*). This will eventually form a tall columnar tree.

Firs (*Abies*), hemlocks (*Tsuga*) and larches (*Larix*) are all found in Bristol parks and gardens but have not been found as street trees or on traffic islands. One spruce, a specimen of Blue Spruce (*Picea pungens* cv 'Glauca'), was noted on Prince Street roundabout - although it did not look likely to survive for long.

BROAD-LEAVED TREES (Angiospermae)

PLANES

The London Plane (*Platanus* × *hispanica*), our commonest street tree, is thought by some to be a hybrid between the Oriental Plane of southern Europe (*P. orientalis*) and the American Sycamore (*P. occidentalis*); alternatively it may be a selected clone from *P. orientalis* (see Bean 1951 for more information). It first occurred in Spain or southern France about 1650 and had been introduced to England by 1680; specimens imported about that time are still flourishing. While the tree certainly does propagate vegetatively and so can be cloned, it can also form fertile seeds - somewhat unusually for a hybrid - so a continuous variation occurs in leaf and tree form. The familiar large leaves have five lobes with varying depths of division between them. Male and female flowers are borne separately on the same tree. The spherical fruits, some 3 cm in diameter (botanically, small achenes borne on pendulous globose heads), occur in pairs or threes. The male flowers, which are also in pendulous globose heads, tend to occur singly and so may cause confusion with *P. occidentalis*, which is vary rare in the U. K. and has single ball fruits. The Oriental Plane (*P. orientalis*) tends to have three, four or five ball fruits and rather deeper divisions between the five lobes of the leaf margin; early in the last century it was planted extensively but today the quicker growing hybrid is generally preferred.

Fine specimens of London Plane can be seen along both sides of Whiteladies Road, also by the Cenotaph in Colston Avenue where they have been allowed to grow upwards and outwards (although lower limbs have been removed). When Queen Square was developed two magnificent lines of London Planes were planted (Plate 2); some have recently succumbed to high winds, so disproving Mitchell's (1974) assertion that "London Plane is never known to blow down". Elsewhere in the streets London Plane does tend to lose its lower limbs, so constant vigilance is needed to avoid accidents.

To add further confusion to nomenclature, a cultivar *P.* 'pyramidalis' was introduced from France in the middle nineteenth century and was distributed widely over the next 50 years by vegetative cloning. Consequently, in Bristol we have a mixture of London Planes: trees planted before 1850 (e.g. Queen Square) are definitely the first form, but later plantings about 1900 (e.g. Whiteladies Road) are a mixture of the two . 'Pyramidalis' can be distinguished by its bristly fruit balls (which may be single), the presence of hairs on its achenes and its more glossy leaves with slightly deeper divisions between the lobes. The mature tree is *not* pyramid-shaped but has a rounded crown; the name 'pyramid' comes from the form of the ascending limbs which assume a vase shape away from the bole of the tree. Lower limbs may be removed earlier than in the true London Plane, making *P.* 'pyramidalis' an excellent street tree. The Oriental Plane is best represented by a magnificent tree outside Amberley House School at the top of St John's Road, Clifton, where the many flower balls, the deeply divided leaves and the copious basal shoots can be seen.

LIMES

The **English Lime** (*Tilia* × *europea*), our second most common street tree, is more straightforward to identify. It is a hybrid between the Small-leaved Lime (*T. cordata*) and the Large-leaved Lime (*T. platyphyllos*), both of which are native to the U. K. and indeed to the Bristol region. Identification may be confirmed by finding small tufts of hairs in the axils of the veins on the underside of the obliquely heart-shaped leaves. Incidentally, the leaves can be even larger than those of the Large-leaved Lime. (When identifying trees from their leaves, always use leaves from a branch rather than from the bole of the tree because the latter are usually not typical.) English Limes are often infested with aphids.

The hybrid occurs naturally in continental Europe and in the U. K., and Dutch horticulturalists have found it easier to propagate than the parent species. Although the English Lime is sparingly fertile (like the London Plane) it is more easily propagated by layering. Unfortunately the specimen chosen by the early propagators for cloning was susceptible to forming huge burrs on the trunk, giving rise to dense clusters of succulent sprouts which have to be removed periodically. Bristol streets in Henleaze, Golden Hill and parts of Bishopston have many excellent examples of English Lime. They seem to be easy to maintain, and once the lower limbs have been removed are ideal trees for use on double-deck bus routes. On the Continent the bulk of street lime trees are *T. platyphyllos* and *T. cordata*; on Clifton Down, near the new site of the Fountain at the top of Bridge Valley Road, there are a few limes which approach *T. cordata*, with small heart-shaped leaves and erect flowers and fruits. The English Lime has pendant flowers and fruits.

The **Silver Lime** (*T. tomentosa*), from the Crimea, is being planted as a pavement tree in the Lawrence Hill area (and doubtless elsewhere). The species is distinguished by its zig-zag branches and relatively long-stalked leaves with a white down on the underside. At the time of writing they are only young standards but when mature will form very large dome-shaped trees similar to their close relative the Weeping Silver Lime (*T. petiolaris*) - in fact the latter may be only a variety of the former. *T. petiolaris* may be seen in all its glory in Clifton Park.

Both the London Plane and the English Lime, being hybrids, exhibit a characteristic 'hybrid vigour'. All examples are actively growing, and it may be that several hundred years from now there will be some real giants in the city!

TULIP TREE

The **Tulip Tree** (*Liriodendron tulipifera*) is a close relative of the Magnolias, a primitive group of trees popular in gardens but rare on the Bristol street scene. An example can be seen on Park Street, at the corner with College Green, and a variegated form 'aureomarginatum' occurs near the car park on the quay behind Queen Square (Plate 3A).

WILLOWS

Willows are uncommon as street trees; specimens are often relics or self-sown seedlings alongside the city's waterways. However, we found the common **Weeping Willow** (*Salix* × *chrysocoma*) on the roundabouts at Bedminster Parade and Temple

PLATE 2. London Planes (*Platanus* × *hispanica*), Queen Square, summer 1992.

Meads, and also as two specimens in Badminton Road, Downend. This hybrid, with silky adpressed hairs on both sides of its leaves, has replaced *S. babylonica*, a native of China once planted here but now very rare (except in botanic gardens such as Oxford or Kew); its leaves lack hairs and have glaucous undersides.

POPLARS

These are poorly represented as street trees in Bristol, despite the presence in local parks and gardens of the Grey Poplar (*Populus canescens*), the Lombardy Poplar (*P. nigra* 'italica'), the White Poplar (*P. alba*), the hybrid Black Poplar (*P.* × *euramericana* 'serotina') and the Golden Poplar (*P.* × *euramericana* 'serotina aurea'). Two new cultivars, Variegated Poplar *(P.* × *candicans* 'Aurora') - dark green leaves blotched pale green, cream and pink, with red petioles - and the oddly named TT32 Hybrid Poplar, could be planted soon. They would both make ideal street trees.

WALNUTS

Walnuts do not lend themselves for use on the streets. The only reason for including the **Common Walnut** (*Juglans regia*) as a street tree is that on the Downs two of the five specimens which exist are planted within 6 m of the road. A fine fruiting specimen of Black Walnut (*J. nigra*) occurs in Canford Lane, Westbury-on-Trym, just inside the Canford Park railing but overhanging the road sufficiently to shower cars beneath with nuts in the Autumn.

BIRCHES and ALDERS

Henleaze streets are fine places to see Silver Birch (*Betula pendula*), an indigenous species. It has shallow roots, and has proved to be one of the first species to succumb to drought. Some have been planted in the Centre, and in time should rival the fine group on the Downs at the top of Parry's Lane. The graceful Swedish cultivar *B. p.* 'Dalecarlica' is being used for street planting in other cities, but has not yet been noted on the streets of Bristol. This variety has a narrow crown and pendulous branches with finely divided leaves; it can be seen from the pavement of St Michael's Park, growing in the grounds of the University Senate House (the former site of the Hiatt Baker Botanic Garden). The White-barked Himalayan Birch (*B. jacquemontii*) is being increasingly planted in Bristol's parks, and its dazzling white stems may soon appear in the City streets. The similar Himalayan Birch (*B. utilis*) with which the previous species intergrades (making identification difficult) is also increasing in popularity. Young trees on St Mary Redcliffe roundabout are from this group.

Alders have been planted in the street more often in recent years. The typical fruits make recognition simple even in winter when the leaves have fallen. In the spring the long male catkins appear before the leaves. Two species occur in the City streets. The Grey Alder (*Alnus incana*) is a widespread European tree with smooth deep grey bark; its ovate leaves are separated from one another by 4-5 cm and bear short grey hairs underneath. There are examples on Park Row and near the Bristol Royal Infirmary. The Italian Alder (*A. cordata*) resembles a luxuriant pear tree with dense shiny heart-shaped leaves. The fruits are large, up to 2·5 cm long. Examples occur in Broadmead (Lewin's Mead) and behind Queen Square. There are isolated specimens of the native Common Alder (*A. glutinosa*) close to the river at Welsh Back.

BEECHES

No species of the southern hemisphere beeches (*Nothofagus*) are known in the streets, although they occur in parks such as Oldbury Court. The northern beeches (*Fagus*) are represented by the indigenous Common Beech (*F. sylvatica*), but nowhere are they common. Single specimens have been noted in Downend, Fishponds, and at the top of The Avenue, Clifton by its junction with Clifton Down. The purple-leaved variety 'Copper Beech' (*F. s. purpurea*) is planted on the Downs but does not qualify as a street tree; many large, fully mature specimens cast deep shade along the streets of Clifton and Redland but they are all growing on private land. The fastigiate cultivar *F. sylvatica* 'Dawyck' is also planted on the Downs and the "weeping" cultivar *F. s.* 'pendula' can be seen by the pavement on Queen's Road, Clifton close to the Victoria Rooms, growing in what used to be the grounds of Forest & Orchard Nurseries. A large, mature Fern-leaved Beech (*F. s. heterophylla*) is growing in Victoria Square, Clifton; new street plantings of this variety are being made in Bath, but not as yet in Bristol.

The Sweet Chestnut (*Castanea sativa*), a member of the beech family, is planted extensively at Ashton Court, Oldbury Court and in other places but is rare as a street tree. Shirehampton Road has two magnificent specimens, while Clifton Wood, Frenchay boasts the only multi-stemmed Sweet Chestnut in Bristol; all three trees may be relics of past estate plantings.

HORSE CHESTNUT

The **Horse Chestnut** (*Aesculus hippocastanum*) belongs to the unrelated family Hippocastanaceae and is a native of Albania and northern Greece. It is common in Bristol as a street tree and makes fine spreading specimens when mature (the lower limbs must be lopped when it is used as a true street tree). There are fine examples in Whiteladies Road and The Avenue, Clifton and along Westbury Road crossing Durdham Down. Everyone is familiar with the 'conkers' produced by this species, but the cultivar 'Baumannii' has double flowers making striking white 'candles' in spring and producing no 'conkers' to cause a nuisance; recent street plantings in Henleaze and Bishopston have been of this form. The fertile red-flowered hybrid (*A.* × *carnea*) is planted on the Downs, and several other species and hybrids occur in parks and gardens, but none are known on our streets.

OAKS

Oaks are uncommon as street trees. In Clifton, particularly around Christ Church and Clifton Green, there are some excellent **Holm Oaks** (*Quercus ilex*), introduced from Spain and Portugal; perfectly fertile, they are a source of autumn food for the larger birds. At the junction by Litfield Place is a fine example of **Lucombe Oak**, a cultivar 'Lucombeana' (raised in an Exeter nursery in the 1760s) of the hybrid *Q.* × *hispanica*, a fertile cross between the Cork Oak *Q. suber* and Turkey Oak *Q. cerris*. This specimen is one of a strain of the Lucombe Oak that shows the thick corky bark of the Cork Oak. Both the Holm and Lucombe Oaks retain their foliage in winter. In the Hillfields area of Fishponds, and particularly in Hillfields Avenue, there are excellent specimens of the **Scarlet Oak** (*Q. coccinea*) and **Red Oak** (*Q. rubra*) of North America, whose foliage turns a brilliant red in autumn. The **Pin Oak** (*Q. palustris*) may also be present - its leaves closely resemble those of Scarlet Oak and ripe acorns (needed for accurate differentiation) were not available. **Turkey Oaks** occur on the Portway as street trees, as does a single specimen of **Sessile Oak** (*Q. petraea*). Fine examples of **English Oak** (*Q. ruber*) occur in the centre of a dual carriageway in Shirehampton, probably as a result of the second roadway being routed around what may originally have been a field hedge. Other oak species and hybrids occur in Bristol parks but not as street trees.

ELMS

The epidemic of Dutch elm disease in the 1960s removed many examples of the genus *Ulmus* from the city's roadsides - Bristol was one of the centres from which the disease spread. On Clifton Down the Ladies' Mile lost all its English Elms (*U. procera*), though there is some regeneration from stumps that were not completely destroyed. However, also on Clifton Down, along the side of Upper Belgrave Road and qualifying as street trees, are several excellent specimens of **Huntingdon Elm** (*U.* × *vegeta*), a hybrid between the native Wych and Smooth-leaved Elms (*U. glabra* and *U. carpinifolia*). They are instantly recognizable by their long, strongly ascending main limbs springing from a short trunk. White (1912) stated that Wych Elms were planted in Queen's Road, Clifton, but no trace of them remains. Various other elm cultivars, as well as examples of other genera in the elm family Ulmaceae occur in Bristol parks and gardens.

Mulberries (both Black and White) and Figs occur in Bristol, but not as street trees.

ROSACEANS

The large family Rosaceae includes cotoneasters, thorns, Medlar, whitebeams and rowans, Snowy Mespil, apples, pears and cherries, and is widely represented as part of Bristol's street tree flora. The authors found some identifications difficult, and ACT would welcome any corrections to those given here.

Cotoneasters are common in parks and gardens but are not really suitable as street trees. Shrub species - *Cotoneaster horizontalis*, *C. simonsii*, etc. - are included in the shrub borders of the St Mary Redcliffe roundabout, and tree hybrids, possibly of the variable *C.* × *watereri* group, occur on the Bedminster Parade roundabout.

Thorns from the genus *Crataegus* are valued for their spring flowers, autumn berries and colouring. Surprisingly our native May or **Common Hawthorn** (*C. monogyna*) is very uncommon in the street (except that it is often the stock on to which other species and varieties are grafted). However, the **Midland Hawthorn** (*C. laevigata*), which has several seeds in the fruit (the May has only one), does occur. While several bird-sown seedlings have entered the wild flora from these plantings, most Midland Hawthorns are the sterile cultivar 'Paul's Scarlet' which has bright red double flowers (e.g. at the foot of the Promenade, Clifton). The pink double-flowered form 'punicea flore pleno' is also to be found. These double forms are technically sterile but not all the styles are replaced by petals, so some red berries are produced which stay well into the winter and serve as bird food. Indeed, the family Rosaceae provides many birds with food well into and sometimes right through the winter.

The true **Cockspur Thorn** (*C. crus-galli*) occurs opposite the Mansion House at the foot of the Promenade, Clifton. It has many thorns, 4-8 cm long, and its leaves are smooth on both sides. Its rich orange autumn colour is among the earliest to appear, while its red fruits stay from October into spring. Near relatives of the Cockspur Thorn, the hybrids *C.* × *lavallei* and *C.* × *prunifolia* occur in the streets of Stoke Bishop, Westbury-on-Trym and Downend. They may be distinguished by leaf shape, extent of hairiness and time of fruit fall: *C.* × *prunifolia* has broad plum-shaped leaves, thorns some 2 cm long, and loses its fruit in winter; *C.* × *lavallei* has many flowers, rather sparse thorns 5 cm long, bronze-red autumn colour and fruits that hang until spring.

Medlars (*Mespilus germanica*) are rare in Bristol parks, where they seem to be grafted on to Common Hawthorn stocks, but we have not found them in the street.

The **Rowan** or **Mountain Ash** (*Sorbus aucuparia*) is very much part of Bristol's street flora. The Rowan has pinnate leaves and varieties having the 'lollipop' tree shape have been cloned. Its berries, usually in fine bunches, are yellow in July and pass through orange to scarlet as they mature in August and September, soon to form food for members of the thrush family and Starlings. There are fine examples in the Hotwells area. Several cultivated varieties of *S. aucuparia* are used in street plantings. The common cultivar 'fastigiata', with dark leaves and large berries, has a narrow columnar form, ideal for a street tree (e.g. Boyce's Avenue, Clifton). New plantings in Broadmead include the cultivar 'beissneri', whose autumn leaves are shining gold; its copper-pink to orange bark shows up well in autumn and winter, and is best seen on a wet day. A single example of the cultivar 'asplenifolia', with deeply cut leaflets, has been noted in Clifton. In Broadmead and the Central area, particularly where trees of fastigiate form are needed, the Chinese Scarlet Rowan

(*S.* 'Embley') and the **Japanese Rowan** (*S. commixta*) are common. In both, the pinnate leaves have 12-15 leaflets. These are narrower in the latter form, which has distinctive shining, sticky, slender deep-red conical buds; in autumn the leaves of *S.* 'Embley' turn through yellow to pure scarlet and then a deeper red, while *S. commixta* turns purple and then red-purple with no yellow.

Rock's Rowan (*S.* 'Joseph Rock') is a common street tree in Stoke Bishop, easily recognized by its globular shape and small yellow fruits. Its crimson and purple autumn foliage shows off the berries to perfection. This form does not come true from seed, so it must be propagated vegetatively and hence all individuals are identical. It originates from a seed collected in Yunnan, China by Dr Rock in the 1930s, and may be a naturally occurring hybrid. The **Hupeh Rowan** (*S. hupehensis*) is a native of western China, with attractive white to pale-pink berries; it has recently been planted in Passage Street near the Floating Harbour, and another excellent specimen can be seen in Lodge Causeway, Fishponds. Two species that occur uncommonly in parks and gardens and so might occur as street trees are the Vilmorin Rowan (*S. vilmorinii*), with fern-like foliage (each leaf has 20-30 small leaflets) and small white berries, and the Kashmir Rowan (*S. cashmiriana*), with bunches of numerous large (12-13 mm) white berries hanging on pale red stalks.

The **Bastard Service Tree** (*S.* × *thuringiaca,* a hybrid between *S. aucuparia* and *S. aria*) neatly links the pinnate-leaved Rowans to the single-leaved Whitebeams. It has the Rowan's attractive dark green leaves, with the dense white woolly fur of the Whitebeam on their undersides. The leaf shape is variable, with 1-4 pairs of leaflets at the base while the remainder is less lobed or entire. The large red berries fall quickly in autumn. A columnar cultivar 'fastigiata' is widely planted throughout the city; a typical example occurs by the University Veterinary School on Park Row.

Surprisingly the true **Whitebeam** (*S. aria*), although native to the region and present in our parks and gardens, seems not to be commonly planted as a street tree. However, the cultivars 'lutescens' (with silvery new leaves) and 'majestica' (with larger but slightly narrow leaves) have been planted, particularly in the Hotwells area near the Cumberland Basin Bridge. The traffic island by Merchants Road here has fine examples of *S.* '**Wilfrid Fox**', a hybrid of *S. aria* and *S. cuspidata,* with finely-toothed elliptic leaves, finely scaled smooth bark and fruits 20 mm in diameter, roughly spherical in shape, which change colour from yellowish green through orange to brown. On the same traffic island are examples of **Swedish Whitebeam** (*S. intermedia*), with broad elliptic leaves having several lobes on each side, and bunches of c. 20 glossy green berries turning bright scarlet. In flower it resembles a hawthorn; the leaf shape and its smooth grey-purple bark with wide shallow cracks serve to distinguish it from the previous form.

In a car park in St George, at the rear of St George Park, are examples of the striking form *S.* '**Mitchelli**', with almost circular leaves. It derives from one of the Whitebeams of the Himalayas, either the very large-leaved *S. cuspidata* or (in a more recent view) *S. thibetica.*

The **Snowy Mesphil** (*Amelanchier canadensis*) is not common in Bristol streets. One specimen which may qualify grows outside Christ Church, Clifton - although its trunk may be on private Church land.

Apples The genus *Malus* occurs in quantity among Bristol's street trees. The hybrid **Purple Crab** (*M.* × *purpurea*) occurs in Westbury-on-Trym, Stoke Bishop, Henleaze and Bishopston, along with specimens of the cultivar 'Lemoinei' derived

from it, which has larger leaves and fruit and a more erect form. In Queen Square there is a Purple Crab which appears to be the more recent cultivar 'Profusion', with bright red flower buds, purple pedicels, reddish-purple leaves and purple fruits; it forms a striking sight in the flowering season, against the green backdrop of the London Plane behind it. Other forms of the Purple Crab may well occur too. A single tree in Abbey Road, Westbury-on-Trym appears to be the Japanese *M. sieboldii;* in flower it resembles a hawthorn and the leaf is hawthorn-like, but the yellow-red pome fruits, 2 cm in diameter, produced in late summer and autumn show it to be an apple. It has clearly been grafted on to a wild apple *M. sylvestris* stock, as this is suckering from ground level. The common Crab Apple (*M.* 'John Downie') is evident in Henleaze and Redland, making a fine sight in Edgecumbe Road with its bunches of long-stalked scarlet pomes at least 3 cm × 3·5 cm in size. The Japanese Crab (*M. floribunda*) makes magnificent specimens in Redland and Clifton gardens (e.g. the Royal Fort) but is not used as a street tree. Doubtless other apples occur: for example, the authors suspect that the Hupeh Crab (*M. hupehensis*) exists in Henleaze, from its distinctive orange-brown bark, but this needs confirmation.

Pears The genus *Pyrus* is very rare on Bristol's street scene, although the Common Pear (*P. communis*) and the Willow-leaved Pear (*P. salicifolia*) occur in parks and gardens. The Chinese Pear (*P. calleryana*) occurs on St Mary Redcliff roundabout as the cultivar 'Chanticleer', distinguished by its erect shape and the masses of white flowers which appear before the leaves; the latter are of a soft green, turning yellow in autumn.

Plums, Almonds, Apricots, Peaches and Cherries The genus *Prunus* is well represented. Westbury-on-Trym, Henleaze, Shirehampton, Stoke Bishop and doubtless other areas have a good scattering of plums. The Myrobalan Plum (*P. cerasifera*), which flowers in March, occurs usually in one of its purple-leaved cultivars 'atropurpurea' (often known also as *P. pissardii*) or the similar but pink-flowered cultivar 'nigra', which flowers even earlier. They occur as single trees, never in great numbers, as too does the Cherry Plum (*P.* × *blireana*), with its large, double, sterile rose-pink flowers; this is a hybrid between *P. c.* 'atropurpurea' and the cultivar 'Alphandii' of the Japanese Apricot (*P. mume*). The Almond (*P. dulcis*) may be seen in Canford Lane, where it is host to Mistletoe, and doubtless elsewhere. The aptly named Rose-bud Cherry (*P. subhirtella*) almost always occurs in street plantings as its cultivar 'autumnalis', the Autumn Cherry. Examples of the striking Tibetan Cherry (*P. serrula*), with its distinctive glossy mahogany-coloured bark, may be seen outside the City Museum & Art Gallery in Queen's Road, in the Straits at Fishponds and in Falcondale Road, Westbury-on-Trym, where there is a splendid multi-stemmed specimen.

The Japanese Cherry (*P. serrulata*) occurs in Bristol streets in a variety of its many cultivated forms; they make good street trees, being strong-growing and very floriferous, though by early summer all the flowers have gone and the heavy green foliage remains until autumn turns it yellow or orange. As a group they are easy to recognize - the leaves, mostly produced after flowering, are large and sharply toothed, often with short hairs on the points, and the trees produce no fruit. The pink semi-double flowered 'Kanzan', common in residential areas, is easily recognized by the branches strongly ascending from the graft union; there are specimens outside the City Museum & Art Gallery and in King Square. The form 'Shirofugen' whose semi-double pinkish-white flowers appear much later, occurs in

Henleaze; when mature it can be 10 m high and widely spread, and so should not be planted alongside bus routes. The tall erect fastigiate form 'Amanogawa' is often seen in gardens but seems not to be used as a street tree, despite its ideal shape. The robust **'Tai Haku'**, the Great White Cherry of old Japan, with flowers 6-8 cm across, can attain a height of 12 m and its branches spread horizontally from the graft union, an unfavourable characteristic for a street tree, yet it may be seen to perfection in Saville Place, Clifton, and in stunted form at the Straits, Fishponds and on the Inner Circuit Road near Lawrence Hill. **'Ukon'**, with greenish-yellow flowers, occurs at the top of the Mall, Clifton, on the edge of Clifton Down, and also in North Road, Leigh Woods.

Our native **Wild Cherry** (*P. avium*) makes a splendid show with its brilliant white flowers followed by soft green leaves; there is an excellent stand at Christ Church, Clifton, but elsewhere they are found as individuals. The single form produces a mass of sour cherries, which can be a nuisance underfoot, but this can be avoided by growing the sterile double form 'plena', which is the common street form, e.g. in the Redland area. Our garden laurels, the **Portuguese Laurel** (*P. lusitanica*) and the **Cherry Laurel** (*P. laurocerasus*) are used in street plantings as hedges and ground cover, in such cultivars as *P. laurocerasus* 'Otto Luyken', e.g. on St Mary Redcliffe roundabout. The Bird Cherry (*P. padus*), Black Cherry (*P. serotina*) and Sargent's Cherry (*P. sargentii*) have not been found by us as street trees, though they are used in gardens and parks; the last-named grows in London streets.

PEAS

The great botanical Pea family Fabaceae is represented in Bristol streets by two species. The first, **Laburnum or Golden Chain** (*Laburnum anagyroides*) is planted in Westbury-on-Trym (e.g. Abbey Road), Henleaze (e.g. Hill Burn) and elsewhere. Its long crowded racemes of yellow pea flowers are attractive in May, but all parts of the tree are poisonous, and to children the seeds are both attractive and deadly. The almost sterile hybrid *L.* × *watereri* (*L. alpinum* × *L. anagyroides)* has consequently become popular and a cultivar of this, 'Vossii' (sometimes listed as *L.* × *vossii*) with racemes of yellow flowers up to 60 cm long, is now familiar in gardens. Although poisonous, its seeds are small and few and so less likely to attract children than those of the type. In St John's Road, Clifton a graft hybrid, or chimaera, between Laburnum and the dark purple Broom (*Cytisus purpureus*) hangs over a garden wall; in summer it bears the pink panicles of the Broom, the pure yellow racemes of Laburnum and yellow-pink racemes of mixed flowers.

The second species is the **Locust Tree or False Acacia** (*Robinia pseudacacia*), which has been in cultivation here for over 350 years but has never become very popular. Examples may be seen in Park Row, near King Street, and in Fishponds. It grows taller than Laburnum, has white flowers and forms stout persistent spines from its stipules; bunches of oblong dark brown pods, 5-10 cm long, hang well into the winter. The cultivar 'Bessoniana', originating on the Continent, has a rather more ovoid crown and very few spines, and makes a good street tree. It occurs in Lodge Causeway, Fishponds and in Redland Road; the authors have never seen it in flower. The very slow-growing cultivar 'Inermis', known as the Mop-head or Parasol Acacia, was found by ALG growing in The Straits, Fishponds; low, round, compact and thornless, and so a target for vandals, the trees no longer exist there. Several tall fastigiate False Acacias, growing opposite the Bridewell Police Station in Bridewell Street, are probably the cultivar 'Pyramidalis'. The golden-leaved

form 'Frisia', now common in gardens, has not been found as a street tree though it would seem to be an excellent candidate for a large planting scheme.

Other members of the Pea family to be seen are the Pagoda Tree (*Sophora japonica*), which overhangs the pavement outside the University Senate House in University Road, and the Judas Tree (*Cercis siliquastrum*), which overhangs pavements in Stoke Bishop; these are, however, growing on private property.

TREE OF HEAVEN

Examples of the **Tree of Heaven** (*Ailanthus altissima*), a member of the tropical family Simaroubaceae, occur close enough to the road in several places on Clifton Down to be counted as street trees while in Victoria Square, Clifton suckers have emerged from a massive specimen growing just inside the square boundary near Merchants Road. However, the best example must be in Montpelier, growing happily at the entrance to the Health Centre car park. The species is dioecious - that is, the male and female flowers are carried on separate trees - and female trees fruit heavily in the Bristol area.

BOX

The British native **Box** (*Buxus sempervirens*) is to be found in the St Philips area as a low bush on traffic islands.

HOLLY

Clifton and Redland abound with Victorian varieties of **Holly** (*Ilex aquifolium* and its cultivars), but the only evidence we found of its use as a street tree was a variegated form on Prince Street roundabout.

MAPLES

Norway Maple (*Acer platanoides*), a native European (though not British) species, is extremely popular and accounts for about 20% of our mature street trees; sometimes (e.g. on Muller Road, connecting Gloucester Road and Fishponds Road) it is grown to the exclusion of all others. The variegated cultivar 'Drummondii' can be seen in Water Lane off Temple Street and in Jacobs Wells Road. The cultivar 'Schwedleri' occurs in the centre of Bristol; it has deep red buds and leaves which open bright pink, mature to green tinged with purple in summer and turn deep orange and purple in autumn. The indigenous Field Maple (*A. campestre*) is known to us as a quasi-street tree only in Saville Place, Clifton, though it may occur elsewhere as it certainly lends itself to street planting and gives a fine yellow colour in autumn.

Snake bark maples are sited as individual specimens in Broadmead. They include **Père David's Maple** (*A. davidii*), **Hers's Maple** (*A. hersii*) and **Red Snake Bark Maple** (*A. capillipes*). Two other species are common in our streets. **Silver Maple** (*A. saccharinum*) can be seen to perfection on the Cathedral side of College Green (Plate 3B), the silver undersides of the leaves showing clearly in any breeze. Some street specimens approach the cultivar 'laciniatum' in which the leaves are deeply divided, though still with the characteristic silver backs. The **Ash-leaved Maple** or **Box Elder** (*A. negundo*; no relation to either Box or Elder!) is common in

PLATE 3. A, variegated form of the Tulip Tree (*Lyriodendron tulipifera*) cv 'aureomarginatum', near car park on the quay behind Queen Square. B, Silver Maple (*Acer saccharinum*), opposite Bristol Cathedral, College Green. Both summer 1992.

Westbury-on-Trym, Henleaze and Stoke Bishop; its large pinnate leaves resemble those of Ash, but with 3-7 leaflets having shallow irregular teeth. It is dioecious, so that not all trees carry the typical drooping racemes of winged fruits. It is often planted as a cultivar grafted on to the type; we have found 'variegatum', whose leaflets have an irregular white border, and 'aureo-marginatum', with yellow instead of white. Their leaves readily revert to green, so variegated and green leaves may be mixed on one tree. A few in Henleaze have curled twigs and leaves, and carry no fruit; we suspect that these are of the all-male cultivar 'crispum'.

The Sycamore (*A. pseudoplatanus*) is thought to have been introduced to Britain by the Romans. Functionally it forms an excellent street tree, though not especially attractive in appearance; the most famous Bristol specimen is at the top of Bridge Valley Road (this may possibly be two trees). Sycamores have large, somewhat leathery five-lobed leaves, often carrying large black patches of Tar Spot (see p. 58); the drooping flowers open after the leaves have appeared, and the wings of the double seeds are roughly at right angles. (In the Norway Maple, which is superficially rather similar, the leaves have shallower lobes with fine points at their tips, and appear after the erect panicles of flowers, while the wings of the double seeds are widely spread.) The cultivar 'atropurpureum', with leaves dark green above and purple beneath, occurs in Sea Mills; there are other varieties in parks and gardens but they have not been noted in the street.

A mature specimen of the **Cappadocian Maple** (*A. cappadocicum*) in St John's Road, Clifton may be part of the original street planting, or even a relic from the large tree and shrub nursery that existed here in the early nineteenth century. A sturdy tree, with a twisted bole, upright branches and a closed canopy, it is one of the earliest maples to change colour in autumn, giving a lovely clear yellow.

ASH

The **Common Ash** (*Fraxinus excelsior*) occurs occasionally around Westbury-on-Trym and Clifton; some not far from the Westbury-on-Trym Ambulance Station may be the **Narrow-leaved Ash** (*F. angustifolia*). The **Manna or Flowering Ash** (*F. ornus*) makes a fine show in Overndale Road, Downend with its smooth dark grey bark, dark green leaves (pale below), and masses of fragrant white flowers in May.

INDIAN BEAN TREE

The **Indian Bean Tree** (*Catalpa bignonioides*) originated in North America, rather than Asia. There are half a dozen excellent specimens in Summerleaze, Hillfields, near Fishponds; also we noted isolated trees in Canford Lane and Sea Mills Square.

SEA BUCKTHORN

The native **Sea Buckthorn** (*Hippophae rhamnoides*) has been planted near the water in Hotwells. The berry-bearing female trees are accompanied by occasional males. The berries are an ideal source of food for birds in winter.

PLANT PARASITES

Parasitism of Bristol street trees by other plants is uncommon and involves only a single parasitic species - Mistletoe (*Viscum album*). The host trees are always introduced forms rather than indigenous species. The Mistletoe on a Common Lime outside Blaise Castle in Henbury has obviously spread from the Blaise estate, where it is widespread. Other instances include a species of poplar in Stoke Bishop, a Silver Maple in Henleaze and an Almond on Canford Lane, Westbury-on-Trym. Doubtless more street trees will become infected, and we hope these will be reported. Mistletoe has been noted on False Acacia and Whitebeam in parkland, and a survey made in Gloucestershire in the 1970s (Holland, 1986) recorded it on 38 host species, many of which are used as street trees. It is not clear why Mistletoe is rare in the Bristol area, but atmospheric pollution from Severnside and from street traffic must be important factors. Recent legislation concerning pollution and the emission of vehicle exhaust gases should eventually help (cf. the increase in lichen populations since the Clean Air Act came into force).

STREET TREES AS WILDLIFE HABITATS

Streets well supplied with trees form 'leading lines' for birds, connecting inner and outer areas, and this has led ornithologists to conclude that few Bristol bird populations can be claimed to rely wholly on the urban habitat (Bland & Taylor, 1989). Street trees provide nest sites for small birds and for Tawny Owls, Collared

Doves and others, including increasing numbers of Magpies, whose large untidy nests are most conspicuous in the winter months. In 1967 ALG noted a Great Spotted Woodpecker nesting in a diseased elm (*Ulmus* sp.) on Downend Road, Fishponds, but the tree was removed soon after. Street trees also form havens from which birds and also Grey Squirrels (a familiar sight in Bristol, particularly in the central areas) forage into gardens and waste ground. The invertebrate life supported by street trees is an important source of food for birds, especially in the breeding season, and at certain times bats are attracted by the flying insect fauna.

Street trees form staging posts for Starlings *en route* for the large winter roosts in Temple Meads Station and under the railway bridge in Cattle Market Road. Others are used as winter roosts proper: e.g., large numbers of Pied Wagtails roost in trees in the Broadmead area, outside the London Life building at 100 Temple Gate, and elsewhere. Substantial numbers of Starlings also sometimes roost in Broadmead, as is obvious from the state of the roofs of cars parked beneath in late evening.

In the street as elsewhere, trees are hosts to many invertebrates, some of which come to our notice as pests or cause nuisance. Indigenous trees support hundreds of species; introduced trees such as Sycamore may carry only a tenth as many species, but there are still an enormous number of individuals. Moth larvae attract much attention, and every few years almost any deciduous tree may harbour a plague of Vapourer Moth *(Origia antiqua)* larvae, with their characteristic bright red side stripe and tufts of hairs. In recent years Common Lime trees in Redland have carried good numbers of the Lime Hawk Moth (*Mimas tiliae*) and its caterpillars.

Large patches of variously coloured scale insects are not uncommon on twigs and leaves; they consist of tiny, relatively immobile insects, which absorb sap through their stylets. Species such as the Bush Scale (*Cryptococcus fagi*) secrete a protective flocculent 'wool'. Sooty moulds such as *Cladosporium* spp. may grow on the excreted honeydew, thereby inhibiting transpiration by the leaves and causing the tree to suffer. Aphids, especially on the Common Lime but also sometimes on Sycamore, are responsible for depositing sticky honeydew onto the roofs and windscreens of cars parked beneath, and onto pavements.

The leaves and stems of trees may be deformed by the proliferation of galls, or swellings, caused by a range of insects such as gall wasps (responsible for the familiar oak apple), mites, aphids, plant lice, scale insects, sawflies and gall midges. Other commonly seen aberrations are caused by fungi: Tar Spot on Sycamore is caused by *Rhytisma acarinum* and the abnormal growths on trunks or branches known as Witches' Brooms are caused by *Taphrina* spp.

Sometimes the tree fauna can help in the identification of the host. In hot dry summers the Common Lime supports aphids which cluster on the upper branches in easily recognizable patches. However, Caucasian Lime does not suffer from this pest and so is tending to be planted more frequently. Both the Common Lime and the Caucasian Lime have a common parent, the Small-leaved Lime native to our limestone flora, and this is also free of the aphid.

ACKNOWLEDGEMENTS

ACT thanks G. Best for help with the identification of invertebrates and plant galls, and S. M. Taylor for checking text. Helen Titchen kindly took notes during many drives around the streets of Bristol.

REFERENCES

BEAN, W. J. (1970). *Trees and shrubs hardy in the British Isles* (8th edition). London, John Murray.

BLAND, R. L. & TAYLOR, S. M. (1989). The birdlife of Bristol. *Proceedings of the Bristol Naturalists' Society,* 48, 63-83.

HILLIER NURSERIES (WINCHESTER) LTD (1991). *Hillier's manual of trees and shrubs* (6th edition). Newton Abbot, David & Charles.

HOLLAND, S. C. (ed.) (1986). *Supplement to the flora of Gloucestershire.* Bristol, Grenfell.

MITCHELL, A. (1974). *Field guide to the trees of Britain and northern Europe.* London, Collins.

TITCHEN, A. C. (1992). Obituary: Adrian Leonard Grenfell (1939-1991). *Proceedings of the Bristol Naturalists' Society,* 51, 10-11.

WHITE, J. W. (1912). *Flora of Bristol.* Bristol.

WILLIS, A. J. (1992). Bristol botany in 1991. *Proceedings of the Bristol Naturalists' Society,* 51, 29-40.

APPENDIX

Check-list of trees seen in Bristol streets and car-parks The nomenclature follows Hillier (1991) and taxa are in alphabetical order.

Acer campestre L.	Field Maple
Acer capillipes Maxim.	Red Snake Bark Maple
Acer cappadocicum Gledditsch	Cappadocian Maple
Acer davidii Franch.	Pere David's Maple
Acer hersii (Rehder) Rehder	Hers's Maple
Acer negundo L.	Box Elder
cv 'aureo-marginatum'	
cv 'crispum'	
cv 'variegatum'	
Acer platanoides L.	Norway Maple
cv 'Drummondii'	
cv 'Schwedleri'	
Acer pseudoplatanus L.	Sycamore
cv 'atropurpureum'	
Acer saccharinum L.	Silver Maple
var. *laciniatum* Rehder	
Aesculus hippocastanum L.	Horse Chestnut
cv 'Baumannii'	Double Horse Chestnut
Ailanthus altissima (Mill.) Swingle	Tree of Heaven
Alnus cordata Desf.	Italian Alder
Alnus incana (L.) Moench.	Grey Alder
Amelanchier canadensis Med.	Snowy Mesphil
Betula pendula Roth.	Silver Birch
Betula utilis D. Don	Himalayan Birch

Buxus sempervirens L.	Box
Calocedrus decurrens Florin	Incense Cedar
Castanea sativa Mill.	Sweet Chestnut
Catalpa bignonioides Walt.	Indian Bean Tree
Cedrus atlantica (Endl.) Carr.	Atlas or Algerian Cedar
Cedrus atlantica glauca Beissn.	Blue Cedar
Cedrus brevifolia Henry	Cyprus Cedar
Cedrus deodara G. Don.	Deodar Cedar
Cedrus libani	Cedar of Lebanon
Chamaecyparis lawsoniana (A. Murray) Parl.	Lawson Cypress
cv 'lutea'	
Chamaecyparis pisifera (Sub. & Zucc.) Endl.	Sawara Cypress
cv 'plumosa'	
Cotoneaster × *watereri* Exell. hybrids	Cotoneaster
Crataegus crus-galli L.	Cockspur Thorn
Crataegus laevigata (Poiret) DC.	Midland Hawthorn
cv 'Paul's Scarlet'	
cv 'punicea flore pleno'	
Crataegus × *lavallei* Herinq.	
Crataegus × *prunifolia* Pers.	
Crataegus monogyna Jacq.	Common Hawthorn
Cryptomeria japonica D. Don.	Japanese Red Cedar
× *Cupressocyparis leylandii* (Dallim. & Jacks.) Dallim. (*Cupressus macrocarpa* × *Chamaecyparis nootkatensis*)	Leyland Cypress
Cupressus macrocarpa Gord.	Monterey Cypress
cv 'Goldcrest'	
Fagus sylvatica L.	Common Beech
Fraxinus angustifolia Vahl.	Narrow-leaved Ash
Fraxinus excelsior L.	Common Ash
Fraxinus ornus L.	Manna or Flowering Ash
Ginkgo biloba L.	Maidenhair Tree
Hippophae rhamnoides L.	Sea Buckthorn
Ilex aquifolium L.	Holly
Juglans regia L.	Common Walnut
Juniperus chinensis L.	Chinese Juniper
Juniperus communis L.	Common Juniper
cv 'stricta'	
Laburnum anagyroides Medikus	Common Laburnum
Laburnum × *watereri* Dipp. (*L. alpinum* x *L. anagyroides*)	
cv 'Vossii'	
Liriodendron tulipifera L.	Tulip Tree
cv 'aureomarginatum'	
Malus 'John Downie'	Crab Apple
Malus × *purpurea* (Barbier) Rehder (*M.* × *atrosanguinea* × *M. niedzwetskyana*)	Purple Crab
cv 'Lemoinei'	
Malus 'Profusion' (*M. lemoinei* × *M. sieboldii*)	
Malus sieboldii Rehder	
Metasequoia glyptostroboides Hu & Cheng	Dawn Redwood
Picea pungens Engelm.	Colorado Spruce
cv 'glauca'	Blue Spruce

Pinus aristata Engelm.	Bristle-cone Pine
Pinus jeffreyi Balf.	Jeffrey's Pine
Pinus nigra Arnold	Austrian-Crimean Pine
Pinus radiata D. Don	Monterey Pine
Pinus strobus L.	Weymouth Pine
Pinus wallichiana A.B. Jacks.	Bhutan Pine
Platanus × *hispanica* Miller ex Muenchh.	London Plane
cv 'pyramidalis'	
Platanus orientalis L.	Oriental Plane
Prunus avium L.	Wild Cherry
cv 'plena'	Double Gean
Prunus × *blireana* Andre	Cherry Plum
(*P. cerasifera* 'atropurpurea' × *P. mume* 'Alphandii')	
Prunus cerasifera Ehrh.	Myrobalan Plum
cv 'nigra'	
cv 'atropurpurea'	Purple-leaved Plum
Prunus dulcis (Mill.) D.A. Webb	Common Almond
Prunus laurocerasus L.	Cherry Laurel
cv 'Otto Luyken'	
Prunus lusitanica	Portuguese Laurel
Prunus serrula Franch.	Tibetan Cherry
Prunus serrulata hybrids	Japanese Cherry
cv 'Kanzan'	
cv 'Shirofugen'	
cv 'Tai Haku'	Great White Cherry
cv 'Ukon'	
Prunus subhirtella Miq.	Rose-bud Cherry
cv 'autumnalis'	Autumn Cherry
Pyrus calleryana DCNE	Chinese Pear
cv 'Chanticleer'	
Quercus cerris L.	Turkey Oak
Quercus coccinea Muenchh.	Scarlet Oak
Quercus × *hispanica*	
cv 'Lucombeana'	Lucombe Oak
Quercus ilex L.	Holm Oak
Quercus palustris Muenchh.	Pin Oak
Quercus petraea Liebl.	Sessile Oak
Quercus robur L.	English Oak
Quercus rubra L.	Red Oak
Robinia pseudacacia L.	Locust Tree, False Acacia
cv 'Bessoniana'	
cv 'Pyramidalis'	
cv 'Inermis'	
Salix × *chrysocoma*	Weeping Willow
Sequoiadendron giganteum Bucholz	Dawn Redwood, Wellingtonia
Sorbus aria (L.) Crantz	Whitebeam
cv 'lutescens'	
Sorbus aucuparia L.	Rowan
cv 'asplenifolia'	
cv 'beissneri'	
cv 'fastigiata'	

Sorbus commixta Hedl.	Japanese Rowan
Sorbus 'Embley'	Chinese Scarlet Rowan
Sorbus hupehensis Schneid.	Hupeh Rowan
Sorbus intermedia (Ehr.) Pers.	Swedish Whitebeam
Sorbus 'Joseph Rock'	Rock's Rowan
Sorbus thibetica Hand.-Mazz. cv 'Mitchelli'	
Sorbus × *thuringiaca* (Ilse) Fritsch (*S. aria* × *S. aucuparia*)	Bastard Service Tree
cv 'fastigiata'	
Sorbus 'Wilfrid Fox' (*S. aria* × *S. cuspidata*)	
Taxus baccata L.	Yew
cv 'fastigiata aurea'	Golden Irish Yew
Tilia cordata Miller	Small-leaved Lime
Tilia × *europea* L. (*T. cordata* × *T. platyphyllos*)	English Lime
Tilia tomentosa Moench.	Silver Lime
Ulmus × *vegeta* A. Ley (*U. carpinifolia* × *U. glabra*)	Huntingdon Elm

THE TREES OF BRITAIN AND NORTHERN EUROPE

A reader whose interest has been kindled by the paper on the preceding pages (*An introduction to Street Trees in Bristol*, by A. C. Titchen and A. L. Grenfell) and who wishes to take the matter further will need an identification guide. Many such are available today; how is our reader to choose, supposing he or she has a general interest in natural history but no specialised botanical knowledge? A work dealing with the commoner trees of the countryside would be of little help. as much of the interest of tree-hunting in Bristol's streets comes from the variety of species and types to be found which are outside the common range.

Clearly portability is essential; this is a case in which Mahomet must undoubtedly go to the mountain, so the chosen book should fit readily into pocket or handbag. Illustrations will be important, and should show leaf shape and colour, including autumn colour where this is special. Trunk colour and texture - important clues to identity, especially in winter - and the general form of the mature tree should be shown; so also, of course, should buds, flowers (both male and female, where applicable) and fruit. Since the work in question is for use "on the street" our reader would probably, like this reviewer, require the illustrations to be alongside the text, and clearly identifiable.

What should our reader expect to find in the text? A sentence about the origin, history or relationships of the tree would not come amiss. Naturally, salient points of identification will be described where they are not already shown in the admirable illustration(s) alongside. Other candidates are: flowering time; special colour changes in autumn; the whereabouts of striking or important specimens; some indication of suitability for our climate and for garden use; and an idea of size both early and late in the tree's life. Preferably, there should be an absence of botanist's geometry - of terms like 'mucronate', 'panduriform' or 'crenate', for which ordinary mortals need the help of a glossary. As to completeness of cover, the forms treated must go where appropriate below the species level, to include important cultivated forms as well as naturally-occurring varieties or hybrids.

One book that fits this severe specification is *The trees of Britain and Northern Europe*, by Alan Mitchell, illustrated by John Wilkinson and published by Collins at £9.99p for the soft-cover version of the second (1988) edition, whose ISBN number is 0-00-219857-6. At 111 mm × 190 mm, with 288 pages, it weighs 375 g or a little over 13 oz, and deals with over 600 tree forms. Each has a common name (invented, where necessary) and - a nice touch - the meaning of all but the most obvious specific names is explained. Likely heights after ten and twenty years, and for the ultimate growth of a good isolated specimen in a favourable locality, are indicated. Garden merit is assessed on a scale of I (first class), II, III and X (little or nothing to recommend it). There are keys to conifers and to broad-leafs, and a separate one to trees in winter, but - even better for the tyro - the four contents pages are illustrated with pictures of typical leaf shapes for each family and group. A short introduction explains tree growth and function clearly and simply.

In this reviewer's view, our interested reader need look no further - he has failed to find any form mentioned by Titchen and Grenfell that is not covered.

S. M. TAYLOR.

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THE RAISED BEACH AND SUB-BEACH DEPOSITS AT SWALLOW CLIFF, MIDDLE HOPE

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ABSTRACT

The famous Ipswichian raised beach at Swallow Cliff is overlain by a Devensian scree deposit and coversand. Beneath the beach, six main horizons form a sequence of angular gravels and cobbles interbedded with fine silty sands. The fine horizons are mainly aeolian (wind-blown) in origin and contain marine microfauna, while the intervening layers of angular, dominantly Carboniferous Limestone gravel and cobbles represent periglacial scree slope deposits. Above the marine platform the deposits were sampled at four levels and found to contain a heavy mineral suite in which garnet, tourmaline and zircon are prominent. Within the main rock platform a localised hollow exists where olivine is the dominant heavy mineral, probably representing *in situ* mineral weathering.

INTRODUCTION

The shore platform and raised beach at Swallow Cliff, Middle Hope (Figure 1) were first recorded in detail by Saunders (1841). Since then the abandoned beach

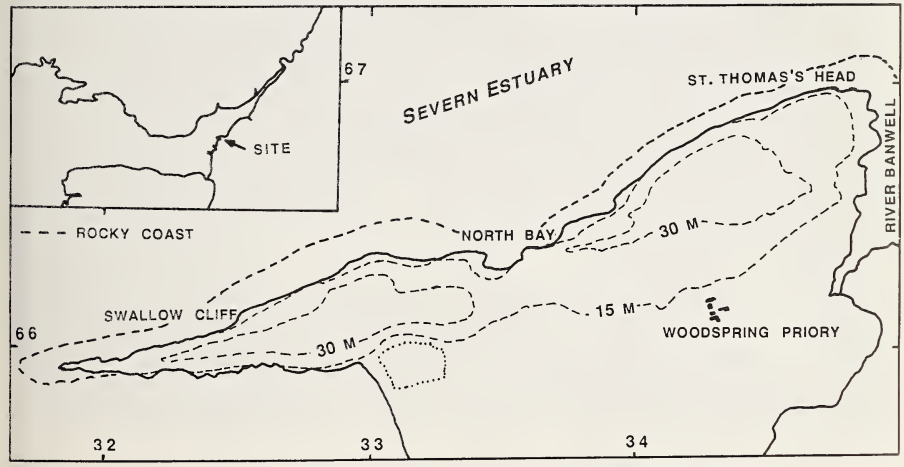

FIGURE 1. Location of Swallow Cliff and North Bay, Middle Hope.

has been described by numerous authors, although few have included notes on the full Pleistocene succession.

The abandoned beach deposits were referred to as the "10 ft beach" by Palmer (1931). Palmer made the extraordinary statement that "Although this beach has been spoken of as the "10-foot" raised beach, in most sections along this part of the Bristol Channel the *base* of the deposit or the level of the rock platform is almost as low as the present high water mark." In fact the beach is 5 m above the top of the present storm beach, hence it should be more properly referred to as a "5 m beach". Zeuner (1959) referred to the deposits as the "Epi-Monastirian" while ApSimon *et al.* (1961) assumed that they represented a mid-Devensian high stand of sea level. Gilbertson & Hawkins (1977) reviewed the available literature and examined the underlying deposits in some detail.

The main abandoned beach is exposed at Swallow Cliff (ST 325 661; Plate 1A), although another less impressive, less fossiliferous and less accessible deposit occurs in North Bay (ST 337 664, Plate 1B). That at Swallow Cliff clearly accumulated over earlier deposits and is now one of the most fossiliferous raised beaches known, with much of the matrix between the rounded coarse pebbles consisting of shells or shell debris (Plate 2A). Gilbertson & Hawkins (1977) pointed out that approximately 80% of the shells are *Macoma balthica,* while *Littorina littoralis* comprise about 10% and *L. littorea* and *Patella vulgata* about 3% each. *L. saxatilis*, *Trophonopsis truncatus*, *Nucella lapillus*, *Ocenebra erinacea*, *Buccinum undatum*, *Nassarius reticulatus, Lora, Ostrea* and *Cardium* (probably *edule*) are also represented. Although *M. balthica* is characteristic of the soft sediments in the estuary, most of the species present in the beach deposits inhabit the modern rocky shores of the Bristol Channel (Little & Boyden, 1976).

Dating of shells from the raised beach by radiocarbon techniques gave dates of $33{,}240^{+760}_{-700}$ and $38{,}900^{+1690}_{-1390}$ yrs BP (Callow & Hassall, 1969). Kidson (1970) rejected these, however, because of the known unreliability of this technique for dating old shell material (partly as a consequence of the ease with which it can become contaminated). The present authors concur and note that an amino acid racemisation study undertaken in 1982 implies an AAR Group II assemblage (Andrews *et al.*, 1984). This assemblage correlates with an Ipswichian age and it is now considered that the storm beach is a remnant of a larger deposit which formed during the Ipswichian interglacial, about 120,000 years ago.

In addition to presenting some general comments on the raised beach, following the work of Gilbertson & Hawkins (1977), this paper provides additional information on the sub-beach deposits which occur between the raised beach and the marine cut platform.

THE SUB-BEACH DEPOSITS

Figure 2 illustrates the relationship of the sub-beach deposits (Horizons 2-7; Plate 2B) to the underlying marine platform (Horizon 1) and the succeeding raised beach deposits (Horizon 8; Plate 2A), adjacent to the Pleistocene cliff line. The horizons identified are described briefly in Table 1; the sub-beach deposits are distinctly interbedded, with quite sharp boundaries between the horizons. Three horizons (Nos 2, 4 and 6) are coarser and comprise mainly angular to sub-rounded material

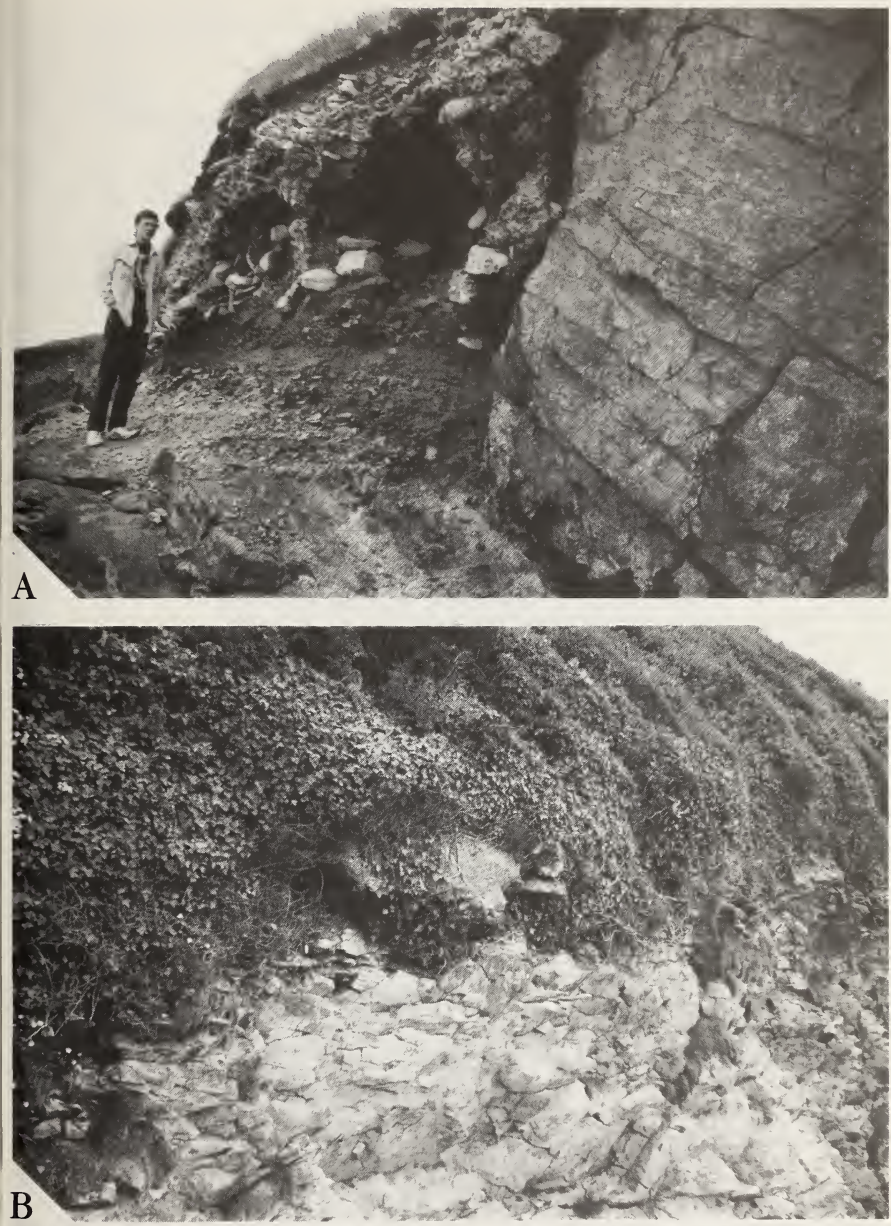

PLATE 1. Middle Hope. A, fossil cliff, marine cut platform with abandoned beach and sub-beach deposits at Swallow Cliff. B, poorly exposed remains of abandoned beach in North Bay.

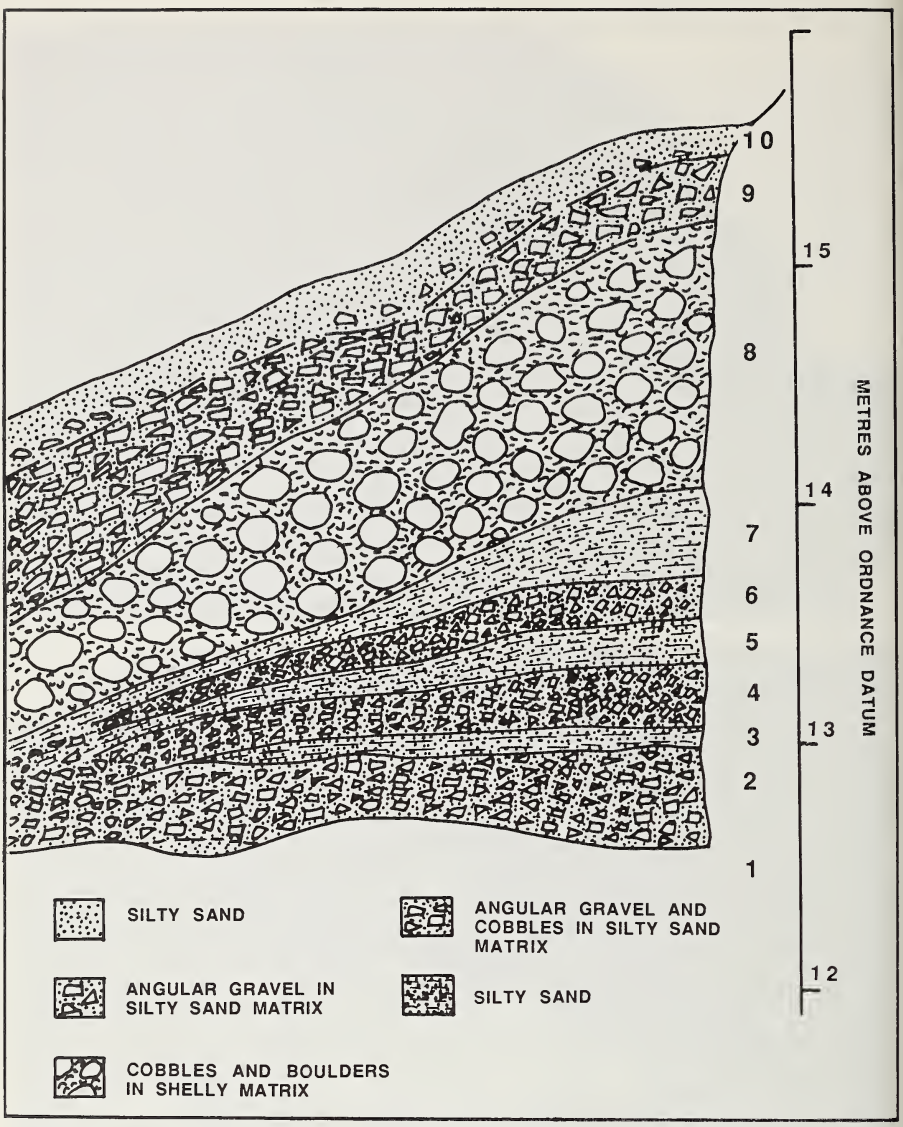

FIGURE 2. Nature of the beach (Horizon 8) and sub-beach (Horizons 2-7) deposits overlying the marine abrasion platform (Horizon 1) at Swallow Cliff, Middle Hope.

of gravel to cobble size. The clast lithology is dominated by limestones and volcanics of Carboniferous age within a silty fine sand matrix. In Horizon 4 thick shells of *Littorina littoralis* and *Nucella lapillus* are present. Interbedded with this coarse material is a red sandy silt with angular gravel containing Triassic

TABLE 1. Main horizons seen at Swallow Cliff, Middle Hope. Horizons are numbered 1-10 and the depth from the modern topsoil to the top of each horizon is given in metres.

No.	*Depth*	*Description*
10	0	Modern topsoil, organic A horizon of Tickenham soil series (Findlay, 1965).
9	0·25	Very stoney sandy loam (7·5YR4/6); rounded and sub-angular clasts on poorly developed coversand predominantly of Carboniferous Limestone; no Greensand chert/flint seen; usually irregular, clear boundary.
8	0·58	"Raised Beach": compacted/cemented shell debris enclosing well-rounded cobbles and boulders mainly of Carboniferous Limestone; undulating sharp boundary.
7	1·58	Sandy loam (7·5YR3/6) with rare stones of weathered ochreous Triassic sandstones, sub-angular weathered Carboniferous Limestone with many shell fragments including *in situ* terrestrial species (Sample S4). 20 mm thick iron-stained deposit at base above uneven sharp boundary.
6	1·68	Very stoney sandy clay loam (7·5YR4/6) with medium to coarse angular clasts of Carboniferous Limestone and flint, weathered Triassic sandstone and marlstones and infrequent rounded clasts of Carboniferous Limestone.
5	1·85	Silty clay loam (7·5YR4/6); occasional angular clasts of Triassic marlstones; occasional clay skins on peds; uneven boundary.
4	2·00	Very stoney silty clay (5YR2/6); coarse sub-angular clasts of Carboniferous Limestone, weathered marlstone and Triassic sandstone; occasional specimens of terrestrial snails and debris of marine littoral gastropods - *Littorina littoralis* and *Nucella lapillus*; slightly cemented by calcareous cement at point contact; uneven boundary.
3	2·15	Silty clay (2·5YR4/4 and 2·5YR4/2) with mottles (2·5YR4/8); some small to medium sub-rounded Triassic marlstone (Sample S3).
2	2·27	Very stoney silty clay (2·5YR3/4); sub-angular and angular clasts of Carboniferous volcanic ash, rounded and sub-rounded clasts of Carboniferous Limestone and occasional Triassic sandstone (Sample S2); sharp boundary.
1	2·54	Bedrock of Carboniferous ash-rich limestones, tuffs and spilites (Sample S1 in hollow).

sandstones and Greensand chert in addition to Carboniferous Limestone (Nos 3, 5 and 7). Horizons 5 and 7 contain an extensive micro-fauna, very similar to that in the silty sands along the wall to the east of the beach (also described from the Holly Lane site at Clevedon by Gilbertson & Hawkins, 1974). It is suggested that they are wind-blown (aeolian) material. This is consistent with the presence of *Vallonia* cf *pulchella*, *Pupilla muscorum*, *Trichia hispida* and *Agriolimax* cf *agrestis*, all of which suggest the presence of open damp grassland.

The fine material has been examined for its textural and micro-morphological features; Table 1 employs the terminology used by the Soil Survey of Great Britain (Hodgson, 1976) but a full discussion is not relevant to the present paper. The fine-grained deposits showed little indication of significant soil-forming

TABLE 2. Heavy mineral assemblages from the sub-beach deposits at Swallow Cliff, Middle Hope. T, trace only.

Mineral	*S1*	*S2*	*S3*	*S4*
Zircon	T	10·6	21·1	7·9
Colourless garnet	T	37·8	45·8	41·6
Pink garnet	T	7·6	6·3	3·2
Brown tourmaline	-	9·1	3·2	14·0
Green tourmaline	-	-	0·5	0·6
Yellow rutile	-	1·5	3·2	1·3
Brown rutile	-	-	1·1	1·7
Staurolite	-	1·5	0·5	2·6
Kyanite	-	1·5	3·7	5·2
Augite	T	1·5	2·1	3·2
Zoisite	T	3·0	5·3	6·2
Olivine	99·8	24·2	1·1	9·9
Others	T	1·5	1·1	2·6
Opaque	75·0	99·5	80·0	64·0
Non-opaque	25·0	0·5	20·0	36·0
Grains identified	1600	66	190	466

activity, although some modification can be discerned, implying wetting and drying cycles. A sample from the localised unit within the marine platform (Horizon 1) showed well advanced chemical weathering, with probably the formation of a soil in an organically active environment. At the base of Horizon 7 there is a distinct, 25-50 mm thick iron-rich zone; unfortunately, there is no way of deciphering whether it was formed before the beach accumulation, but this appears probable.

The heavy minerals were determined for four samples, designated S1 - S4, from Horizons 1, 2, 3 and 7 respectively. The results are presented in Table 2. The dominant mineral in the hollow (S1) is olivine, which is probably a weathering by-product of the underlying volcanic rocks. Garnet is the commonest mineral in samples S2 - S4 and, from their colour and refractive index, the main species are believed to be grossularite and almandite. The other main minerals present are zircon and tourmaline. Although the origin of some of the heavy minerals is not clear, the present estuarine deposits also contain these minerals so it is likely that they are present in existing rocks - hence their presence may not have any direct diagnostic significance.

DISCUSSION AND CONCLUSIONS

The raised beach deposit at Swallow Cliff (Horizon 8) is clearly interglacial in age, the fauna consisting of typically warm water species similar to those found in the estuary today. Evidence from amino acid racemisation supports the beach being realistically dated as Ipswichian. The underlying deposits (Horizons 2 - 7) are clearly different and unlikely to be of interglacial origin. The layered nature of the

PLATE 2. Swallow Cliff, Middle Hope. A, abandoned beach showing rounded pebbles in very fossiliferous matrix. B, sub-beach deposits below the abandoned beach.

materials and the scree nature of the coarse horizons are typical of cool, moist intervals, while the dominantly aeolian material forming the finer layers is typical of that which accumulated during drier conditions. At such times, when sea level was low, material could easily be moved by the strong arctic winds (see also ApSimon *et al.*, 1961; Findlay, 1965). As these deposits are below an Ipswichian raised beach, by implication they are likely to have accumulated during a previous glacial phase, i.e. the Wolstonian.

Modern examples suggest that the marine abrasion platform would have been developed between mean sea level and at least mean high water neap tides. It must be assumed that this was an area of very active erosion as no beach deposits are present immediately above the platform. In the Wolstonian the area was clearly exposed due to falling sea levels and at this time a series of almost horizontal scree and aeolian deposits accumulated. Although the deposits abut a buried cliff, there is no evidence of their being banked against the old cliff line. This implies that there must have been some reworking of the scree material which would have been expected to accumulate at an angle of repose against the steep rock slope.

With the rise in sea level in Ipswichian times, the periglacial horizons were inundated and a very fossiliferous storm beach accumulated. Subsequently, during the Devensian the abandoned beach was covered by a scree slope deposit of angular clasts. Above this are the ubiquitous aeolian-derived coversands on which the modern topsoil has developed.

REFERENCES

ANDREWS, J. T., GILBERTSON, D. D. & HAWKINS, A. B. 1984. The Pleistocene succession of the Severn Estuary: a revised model based upon amino acid racemization studies. *Journal of the Geological Society*, 141, 967-974.

APSIMON, A. M., DONOVAN, D. T. & TAYLOR, H. 1961. The stratigraphy and archaeology of the Late-Glacial and Post-Glacial deposits at Brean Down, Somerset. *Proceedings of the University of Bristol Spelaeological Society*, 9, 67-136.

CALLOW, W. J. & HASSELL, G. I. 1969. National Physical Laboratory radiocarbon measurements, VI. NPL126, *Radiocarbon*, II, 131.

FINDLAY, D. C. 1965. *The soils of the Mendip District of Somerset.* Memoir of the Soil Survey UK, Harpenden.

GILBERTSON, D. D. & HAWKINS, A. B. 1974. The Pleistocene deposits and land-forms at Holly Lane, Clevedon, Somerset. *Proceedings of the University of Bristol Spelaeological Society*, 13, 349-360.

GILBERTSON, D. D. & HAWKINS, A. B. 1977. The Quaternary deposits at Swallow Cliff, Middlehope, County of Avon. *Proceedings of the Geologists' Association*, 88, 255-266.

HODGSON, J. M. (ed.). 1976. Soil Survey Field Handbook: description and sampling of soil profiles. *Soil Survey Technical Monograph No. 5.*

KIDSON, C. 1970. The Burtle Beds of Somerset. *Proceedings of the Ussher Society*, **2**, 189-191.

LITTLE, C. & BOYDEN, C. R. 1976. Variations in the fauna of particular shores in the Severn Estuary. *Estuarine and Coastal Marine Science*, 4, 537-544.

PALMER. L. S. 1931. On the Pleistocene succession of the Bristol District. *Proceedings of the Geologists' Association*, **42**, 345-361.

SANDERS, W. 1841. Account of a raised sea beach at Woodspring Hill, near Bristol. *Report of the British Association for the Advancement of Science, Transactions*, 102-103.

ZEUNER, F. E. 1959. *The Pleistocene Period, its climate, chronology and faunal successions*. London, Hutchinson.

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